ABDOMINAL DISEASE.

Clinical Lecture delivered by T,Lauder Brunton M.D., F.R.S. at St Bartholomew's Hospital on Friday February 10th, 1899.

Gentlemen:- One of the most difficult subjects unquestionably is the diagnosis of abdominal diseases, and the case that I wish to bring before you to-day will illustrate the difficulty of diagnosis of abdominal tumours. I am not prepared to give you a definite diagnosis and all that I am going to do is simply to mention to you the methods employed and the approximate result at which we have arrived. The case is one in "Elizabeth", Julia Bond, whose occupation is that of Office cleaning. Her age is 47; she was admitted on January 16th of this year. She has generally been subject to a cough during the winter, but with this exception she has been a very healthy woman until seven months ago, when she noticed a pain in the left side of the abdomen after food. She had vomiting and the bowels were costive. Four months ago she had noticed a lump in the left side which has gone on increasing. There has been a continuous loss of flesh. She has suffered a good deal from pain which is paroxysmal in nature, lasts about 5 minutes at a time and is accompanied by a feeling of swelling and increased prominence of the tumour. Now although it is somewhat disturbing the natural sequence of events, I had better give you a diagram showing the appearance of the tumour as at present observed, so that you may be able to follow more easily the history of the case. The tumour is situated in the left hypochondrium, projects from under the ribs and is approximately of the form indicated in the drawing. It is somewhat in shape and appearance; it is hard and nodulated on the

surface; it is pretty freely ~~movable~~ moveable. One can push it downwards, so that the upper edge of it shall be quite below the umbilicus or one can push it to the right side so that the left end of it is almost on a level with the umbilicus. This tumour increased and became more prominent when there was any wind in the abdomen, and the paroxysmal pain diminished at the same time that the size of the tumour decreased when the wind moved, and borborygmi were heard in the abdomen. The appetite has failed since the beginning of the illness. She has vomited two or three times in a week one hour after food. The vomiting is preceded by eructations of a mouthful of hot sour tasting water and is preceded also by pain and followed by relief. The vomit has never contained blood; it is in large quantity, more than what the preceding meal amounted to; it is sour in taste, but is not putrid. The pain is brought on by taking food, but it also occurs independently of meals. The patient has often gone seven days without the bowels being open. Constipation always aggravates the pain. The motions are hard and do not contain blood. There has never been any diarrhoea or rectal discharge. She had amenorrhoea for 18 months, but there was no discharge from the vagina. Latterly she has been short of breath and has lost weight. She has had eleven children, three dead, one of measles one of consumption. The family history is suggestive of malignant disease. Her father died of cancer of the oesophagus and one sister died of cancer of the womb. When she came in the other organs were natural and there was nothing wrong with the exception of this tumour. The skin of the abdomen having been distended by so many pregnancies was very lax. It is noted that the left end of the tumour of which I have given a diagram disappears behind the costal arch. The note over the tumour is dull above and below; it is resonant, the spleenic dulness begins at the

eighth rib and extends to the lower border of the tenth rib. The urine is normal, the legs free from oedema, temperature normal.

Now, the question arises, what is the nature of this tumour? I have here a cast of the viscera in the body and by placing a piece of paper in the position of the transverse colon and then inserting the stomach in its place you will see that the position of this tumour corresponds very closely with that of the transverse colon, that the piece of paper representing the transverse colon would appear below the ribs and that the left end of it would be concealed ~~below~~ by the ribs in the same way as the tumour in the patient. Moreover, a very significant note was made that peristaltic movements were observed in the tumour from right to left, so that at first there seemed to be no doubt whatever that this tumour was one of the transverse colon and almost certainly of malignant nature. Such tumours may vary a good deal in apparent size, as you can well imagine, because faecal matter may be passed on through the intestine and may accumulate behind the tumour, its further passage being barred by the constriction of the intestine to which a tumour gives rise. As this faecal matter gradually gets dissolved by the passage of fresh soft matter over it, you may get the tumour varying in size, the right end of it becoming smaller or larger as the case may be. Very little change has been observed however in the tumour we are discussing. Another point that was of considerable significance was that the tumour was observed to move very freely on inspiration. Now, this free movement on inspiration generally is noticed in organs which rest upon the diaphragm, such as the liver, but it is not observed markedly in those organs which are not resting upon the diaphragm. This movement on inspiration could perfectly well be explained on the assumption that we have to deal here with a tumour of the transverse colon because the end of the transverse colon rests just on the diaphragm. So that if it were

hardened by the presence of carcinomatous matter in its wall the movement of the diaphragm would be transmitted to the tumour and would quite explain the movement which was observed. So clear then seemed to be the diagnosis that I had no doubt whatever about it and, when I first saw the patient, began to discuss the treatment of the case which resolved itself, in my opinion, into opening the abdomen and probably short circuiting the large intestine. Bag Diagram represents the large intestine, A, the part involved by the tumour. What one would try to do would be to bring up a portion of the intestine from below, say the sigmoid flexure, attach it to the transverse colon above the part affected by the tumour, making an opening, and thus the part affected by the tumour is thrown out of functional activity. The intestine is short circuited, and thus instead of allowing the faecal matter to pass over the diseased part you bring it through the healthy part and leave the diseased part free.

In cases of malignant disease of the large intestine this short circuiting is very beneficial. The patient's pain is relieved and life prolonged provided always it be not left until too late, when the patient is very likely to die from the operation within the course of three days. I looked upon the diagnosis as being so certain that I hardly thought of doing anything more, but it seemed the right thing to try some of the other methods which assist one in the diagnosis of abdominal tumours, and so we got an effervescent powder and making the patient drink this with some water we distended the stomach. In Germany carbonic acid is very often used or even simply air blown in by means of a spray producer bag through a stomach tube. It is however more convenient and less trouble to the patient to get the stomach distended by making them swallow an effervescent powder. I had made out, as it appeared to me, before that

the part of the abdomen marked B. contained the stomach, although I was struck by the fact that it was singularly void of the resonancethat one usually gets over the stomach. However, I assumed this to be the stomach and what I expected to find on making the patient swallow an effervescent powder was that this part of the abdomen would be greatly distended and that the other part would remain exactly as it was. To my astonishment, however, I found that after the patient had swallowed the powder this part of the abdomen remained just as it was, whereas the part of the abdomen down below, almost down to the umbilicus became very considerably distended, and on listening over the distended part we could hear the filling of gas becoming disengaged right under the stethoscope. In order to make sure that the stomach really was in the lower part of the abdomen, as it seemed to indicate, we tried the other methods by which we ascertain the size and position of the stomach, namely, percussion. One noticed on percussing over the part below the umbilicus that it was resonant for the ordinary percussion. You know that there are three methods of percussion, one of which is recommended strongly by some foreign authorities. It is the old method namely, simple immediate tapping upon the parts - so-called immediate percussion. Then the ordinary way of percussion in which you lay your finger upon the abdominal wall or thoracic wall and percus upon that, and the third is called auscultatory percussion. You put upon the chest or abdominal wall a stethoscope and percus over the wall of the abdomen or thoracic wall while you listen. Supposing, for example, that you put your stethoscope over the stomach and then begin to percus from Poupart's ligament, pressing upwards you notice that as you gradually come nearer to the stethoscope at one point the sound gets very much louder and that point you will find generally coincides with the margin of the stomach as you have previously ascertained it

by ordinary percussion. Another method used is auscultatory friction. In place of tapping the stomach you simply draw your finger along the surface of the skin and again you hear as you cross a certain line a great increase in the sound. By these means we ascertained that the stomach was really below the tumour and came almost down to the pubes. This of course seemed to alter our diagnosis because it appeared that the tumour ought to have been driven down, if it was, as we imagined, a tumour of the transverse colon. It seemed as if it ought to have passed right down with the stomach nearly to the pubes and all the more because, as a rule, the transverse colon being very moveable, when it is affected by tumours they generally come low down below the umbilicus, but this seemed still to remain rigidly up above the umbilicus. We began to think then that after all the tumour might not be in the transverse colon, but might really possibly be in the stomach and if so it would require to be in the upper part of the stomach close to the oesophagus. But then came the difficulty that if the tumour were here there ought to have been some interference with swallowing and this has not existed. The next thing one might have thought of and which we have done but not in the same order was to blow up the large intestine while the stomach remained empty. We tried that by means of carbonic acid gas, but for some reason or another, although the gas seemed to be entering the intestine and did not seem to be escaping through the anus, yet the intestines did not become distended by it. What the reason was we have not yet made out. We then injected a quantity of water and we found that the lower part became dull and that the tumour appeared to be driven up while at C the large intestine seemed to come. This again appeared to shew

that it was not in the intestine but rather in the stomach. In order to make as sure as we could we tried another method which was to light up the stomach from within by putting in a long flexible sound with an electric light at the end. When the stomach is filled with water and this sound is passed down and the electricity is turned on we get quite a bright light and when the stomach is filled with water the light has a diffused glow over the whole of the stomach walls, but if the stomach be empty or only partially filled we get bright spots of light which appear and ~~xix~~ disappear according to the movements of the sound. On putting this tube into the oesophagus it went down without any difficulty. It did not seem to be caught at the cardiac extremity of the stomach and that appeared to shew that there was no constriction there. As it went down it appeared to catch against the tumour and to push it a little before it, making it more oblique in position than it had been before, so that when we moved the sound about the tumour slightly moved with it. This might have been due to its having gone into the pyloric extremity of the stomach. It might quite well have passed down in the curvature and then caught in the pyloric end of the stomach. So that if we suppose there was a tumour involving the pylorus and the lesser curvature, this was exactly what we might expect and it is a possibility. At the same time, although this is quite possible and perhaps I might say is probable, yet the persistence of the tumour under the left hypochondrium is rather against it. You must always remember that tumours of the pylorus may be felt almost anywhere over the abdomen. They are very moveable and some of you may remember a case we had in Hospital where the tumour could be moved in a variety of directions and over a very considerable

extent indeed. So that you may get a tumour of the pylorus apparently at the left side of the abdomen. I am not certain that this tumour with which we have to deal is not one of the upper part of the stomach involving the pylorus and the lesser curvature, and having given rise to a great dilatation of the stomach, as such tumours do, the stomach has as it were passed over the intestine. Another possibility is that it may after all be a tumour of the large intestine and the stomach has become dilated and passed over it. I have been thinking how we could ascertain this and the only way that suggests itself to me without operation would be to distend the stomach very greatly and see whether we can manage to get a tympanitic note over the tumour; because if we can do that then we should know that there was lying over the tumour something capable of distension. It is not likely that this tumour if it be in the stomach is in the posterior wall; it is much more likely to be in the anterior wall and if we find a tympanitic note over the tumour I think we may be pretty confident that it is really a tumour of the transverse colon. The idea of its being pyloric is rather substantiated by the fact of the great dilatation of the stomach and by the symptoms, which point to a great extent to disease of the stomach rather than of the intestine, although the obstinate constipation might be looked upon as indicating intestinal disease. Yet still the pain coming on after food and the vomiting, the vomit being sometimes greater in quantity than the food that had been swallowed, all seem to point to disease of the stomach. Under the circumstances I think it would be quite justifiable to have an exploratory operation because if it should turn out that this is really a tumour of the colon it would be quite possible by short circuiting

it to do the patient a great deal of good. If it should be in the stomach one might do a certain amount of good by gastro-enterostomy. As to whether it would be advisable to do anything more I am very doubtful indeed. I doubt very much whether any more severe operation such as excision of any malignant tumour in the stomach itself would be borne by the patient. I think that in all probability the patient would sink under the operation and we would get no good at all. I think we will ask Mr. Walsham to do an exploratory operation in order to decide whether the tumour be one of the colon or of the pylorus. If it be the first-named then he might short circuit it and if it be the latter he might perform gastro enterostomy. Both operations would give the patient a fair chance without the risk being very great but anything further would I think be out of the question.

I have only been able to shew you the methods we have adopted and I think before having resort to an exploratory operation we shall try to blow up the stomach and see if we can determine whether the tumour is in the colon or stomach.

REGISTERED TELEGRAPHIC ADDRESS.
LAUDER BRUNTON. LONDON.

10, STRATFORD PLACE,
CAVENDISH SQUARE,
W.

Alb. Sero. Terror.

Albuminuria - Kinds of alb. egg.
True & false -
abnorm
Temporary & permanent.
Temporary - from infarct. Mercury.
Overexertion. Strain, fits.
Posture.
Adolescence

Life Assurance - Permanent refuse

Diagnosis
Prognosis
Life Assurance

ALBUMINURIA.

A Clinical Lecture delivered by Sir Lauder Brunton. M.D.,F.R.S., at St. Bartholomew's Hospital, on Friday November 2nd, 1900.

Gentlemen:- We have the the wards just now several cases of Albuminuria, and these cases, as you will see, are very slow in improving, are very difficult to treat, and are on the whole very unsatisfactory; so much so that one almost dreads to get cases of albuminuria into the wards. When a doctor sees how very slow a case of albuminuria is to get well, how constant is the downward progress in many instances, he is generally very much afraid if he finds, on examining his own water, that albumen is present, and some doctors have felt the greatest possible terror on making this discovery. Naturally, this terror would be well grounded if albuminuria had always the same significance, but it has not. The cases in which albumen is found in the urine may be of very grave importance, or may be comparatively slight. We are very apt to forget that albuminuria is only a symptom and that its significance may be as different as that of a cough. One cough may indicate only a little congestion in the larynx, which after a week or two will pass off and will leave no trace behind, while another cough may indicate commencing phthisis, which will assuredly run on to a fatal termination. And yet the cough due to laryngeal irritation may be very violent, may rend the patient almost to pieces, whereas, the cough indicative

of very serious disease is exceedingly slight; a sort of "hem, hem", a slight hacking cough as it is termed, an expression that is familiar to everybody from their seeing it in novels. In the same way with albuminuria, a slight albuminuria may be significant of a very serious disease which is likely to end fatally and soon, whereas, a heavy cloud of albumen may be indicative of almost nothing; so that you cannot judge at all from the amount of albumen present in the urine, but you must take other circumstances into consideration. As an illustration of what I mean, I was once sent for to see an old gentleman between 70 and 80 years of age, who had what was termed "angina pectoris". As soon as I saw him, I said "This is not angina pectoris; it is renal asthma. It is not due to the ordinary affection of the heart or the systemic vessels; it is probably due to some sort of spasmodic contraction of the pulmonary capillaries".

This old gentleman had an income of over £30,000 a year. His life was very valuable, because at his death the whole of the property would pass to a distant branch of the family, and so he had a doctor in constant attendance, who had absolutely nothing else to do except to look after the old gentleman. I asked the doctor if there was any albumen in the patient's urine. "Oh, no" he said, "there has never been a trace of it". I got some of the patient's urine and put it in a test tube. I found that it was very pale, of low specific gravity, and when I warmed the urine in the test tube, I found that there waa a very slight haze. It was hardly perceptible except when you held the test tube against a dark background, but that slight haze indicated that the old gentleman's kidneys were seriously diseased; that he was, in fact, suffering from contracted

kidney in a very advanced stage. I cut him down to a pauper's diet; cut down the dietary not to his position in life, but just to what his kidneys could excrete. A little while afterwards the old gentleman, who had been getting on very well, fell into the hands of somebody else, because I had unfortunately become ill and been obliged to go away, and I very shortly afterwards learned of his death. I have little doubt that whoever was called in subsequently thought it was an awful shame to keep an old gentlemen with £30,000 a year coming in upon nothing but a little skilly, as if he had been a pauper in a workhouse, and yet if he had been kept on skilly he would probably have gone on living perhaps for months even for years longer.

On the other hand, you may find a very heavy precipitate of albumen in patients where it does not mean anything, or, at least, where it does not mean any serious disease, and this is one of the conditions that makes it so very difficult to give an exact prognosis in cases of albuminuria. There is one man now, a young fellow, whom I have watched for fifteen years, and he has had a lot of albumen in his urine all that time. It has been more or less a permanent condition; yet, to look at him, he is perfectly well and practically he is perfectly well. The only thing is that he has been obliged, or rather I ought to say, he has been advised to spend his winters abroad, so as to avoid the chills that would be hurtful to him in his condition. I do not know that it has been absolutely necessary for him to spend his winters abroad, but he was well off and I thought he had better not run any risks, and as he did nothing at home, he might just as well do nothing abroad. Otherwise, I do not think it was necessary for him to go abroad.

Another example was one that I saw some fifteen or sixteen

years ago; a typically healthy man, who hunted his hounds five days a week, and was never sick and never sorry. Somehow or another his urine had been examined and was found to contain a lot of albumen. I happened to have to see him for life assurance, and on examining the urine I found a heavy cloud of albumen and this has continued ever since. I was asked about the advisability of taking his life for insurance purposes. His father died at the age of 53 without its being exactly known why he died. He simply failed and died. My own belief was that probably the son also suffered in the same way as the father, and that he very likely had had albuminuria which had not been discovered. I advised the Office to take the life for a limited period, so that the whole of the premium should be paid up in ten years, and I said that for that time I thought the life was good, and that they might make a profit upon the insurance by charging him a pretty heavy extra for the increased risk. They did not take my advice, but they waited two years and then they took him and even after the delay of two years, he has proved a very good investment for the office, because he has paid up all the extras for three or four years past and he is still alive. He is now, however, beginning to fail, and probably he will die at an age exceeding that of his father by about four years. These two instances, I think, show you how difficult it is to be exactly certain of the prognosis. I might add to these a third, that of a medical man who told me 28 years ago, of his horror when some ten years before he discovered a lot of albumen in his urine. On account of this he was not able to insure in the Medical Assurance Office, but he has lived on all those years. He is now a very old man and, for his years, he is a very strong man. His albuminuria

was very easily explained. It was the albuminuria due to malaria, and it usually came on in the morning and he was free from it in the later parts of the day.

Now, a good many cases of albuminura are more or less intermittent. They may be intermittent in the sense that they last only for a certain part of the day and then disappear, or that they may last for several days together and then disappear for a more prolonged period. Amongst the intermittent albuminurias which last for a short time, are those which come on after exertion. It has been noted especially in Germany that after soldiers have marched for awhile, a number of them show albumen in the urine, although in every other respect the men appear to be perfectly healthy. The same thing has been noted after violent exertion amongst athletes after they have been playing heavy games or where they have taken long walks or severe climbs. It is noted also in violent exertions due to pathological causes. For example, in men who have had an epileptic fit, where all the muscles have been in violent contraction. You know that exertion of any kind tends to raise the blood-pressure, and probably the appearance of albumen in the urine in these cases has been due to some disturbance of the circulation. Blood-pressure is also raised by exposure to heat. Heat as a rule dilates the peripheral vessels and allows the blood to flow more rapidly through, so that the blood-pressure ought, one would say, to fall, but the dilatation of the peripheral vessels seems to be more than compensated by the increased rapidity and increased force of the cardiac beats; so that upon the whole the blood-pressure rises instead of falls. After exposure to great heat, whether it be external heat, as in various trades, or to the sun in hot climates, or heat generated

in the body, as in infective fevers, we are very apt to find a certain amount of albumen appearing in the urine. There is another form of albuminuria which appears and disappears at various times of the day, but is more markedly dependent upon physical exertion of a different nature from that to which I have just been alluding. In the cases that I have just referred to, the albuminuria appears from an alteration in the blood-pressure caused by the exertion, but in cases where you have to deal with a stone in the kidney, albuminuria comes on after exertion, but not in consequence of alteration in the blood-pressure. It is in consequence of local changes in the kidneys. When the stone is not quite firm in the kidney, the exertion of walking may cause it to move about so much as to give rise to great renal irritation and to the presence of albumen, if not of blood, in the urine, but this kind of albuminuria differs from that due to exertion simply, in this respect. That the albuminuria due to a stone in the kidney, comes on quite as readily, or more readily, after certain kinds of passive exertion than it does after active exertion. For example, we had a patient in the wards who had albuminuria and in whom I suspected the presence of a calculus. We accordingly got the patient to take a ride in an omnibus down the Old Kent Road, where the jolting is very severe, because the omnibus wheels get caught in the tramway lines and there is a jerk here and a jerk there, and if there is anything likely to bring on albuminura or even bleeding from the kidney in a case of renal calculus, I should think it is a ride on an omnibus down the Old Kent Road. You will find, however, that bleeding and albuminura may come on in a case of calculus simply from walking, and there is one point to be noted about this; that you may get bleeding and albuminuria coming

on in a patient who has a renal calculus,,without the slightest indication of pain or inconvenience. This is a strong statement to make, and I should not make it unless I were absolutely certain. I have not many cases to refer to, but there was one case which impressed itself very much upon my mind. A good many years ago I went for a walking tour in the Tyrol with a medical friend of mine. One day I noticed that his urine was very dark, and I said to him "It is very dark; it looks almost as if there were blood in it". He replied "Oh, it is always so after exertion. I pass a little water and it is very thick" We went up-hill and down-hill, and sometimes, both of us being very light, we went down the hills at a pace that astonished the natives very considerably. This meant that there was a tremendous amount of jolting, because in going down the hills we used to stick our alpenstocks into the ground and then swing round on them; so that we would take ten or twelve feet at every step; yet, in spite of that, my friend never had a trace of pain. About a couple of years afterwards, he had been complaining of pain in his back and this got worse and worse until finally he could not do any/more work. He was attached to one of the London hospitals and he took his holiday as usual in the autumn, but instead of going away, as everybody expected and one or two supposed he had done, he went up to his bedroom and there he got a surgical friend to excise the stone. It was a great thing, about 1¼" long and ¾" broad and very rough on the surface. He stayed three weeks in his bedroom and then went away for three months, and came back perfectly well and has remained well ever since. But I mention this absence of pain as an important thing because you might be misled in a case of renal calculus, if you thought that pain was a necessary

concomitant of this disease. Another cause of albumen temporarily in the urine is when there is a local irritation in the kidney, not in the pelvis itself but in the substance of the kidney. When there is a hard calculus sticking in the kidney, it causes local irritation in the pelvis, but if you get an infarct in the kidney, you also get albumen or albumen with blood appearing in the urine. In a case of valvular disease, acute or chronic, when the patient begins to complain of pain in the back and you find that the urine begins suddenly to show a cloud of albumen or albumen with blood, then you suspect the presence of an infarct, and this infarct may come on even though there is nothing definite in the heart itself. You may sometimes get an infarct in cases where you have previously suspected nothing but a very atheromatous aorta. I remember seeing in one old lady - I did not see the infarct, because she did not die- but I had no reason for doubting the diagnosis, that she had got an infarct in the kidney, and there was apparently nothing in her heart except atheroma. The infarct here is a large one, stopping the blood vessels, in cases of mitral aortic disease, but you may get what you may term a tubular infarct coming on after poisoning by mercury, and the infarct in such a case is in the tubules. It does not consist of mercury, as you might imagine, but it consists of carbonate of lime. It would almost seems as if the mercury had displaced the carbonate of lime from the bones and made it form an infarct in the tubules, and in many cases of poisoning this has been noted, but my attention was directed to it in another way. I have had men come to me who said that they were feeling perfectly well, but they had been up for life insurance and their lives had been rejected because they had got

some albumen in the urine, and on making enquiries I found that these men had had syphilis and had been taking mercury for many months. I have not got all the cases collated, but I have put one or two of such patients on iodide of potassium and after a while the albumen disappeared. They had been referred by the Medical Officers to the Insurance Societies for three months and at the end of the three months they went up and were accepted; so that in cases where a man has been taking mercury for some time for syphilis, and you find albumen appearing in his urine, you must remember what occurs in acute poisoning by mercury, because you will probably find that these men have not the serious disease of the kidney that you would imagine, but only some of their tubules probably have got blocked with some carbonate of lime and that these will by-and-by get alright again and the patient urine recover its normal condition. These cases of mercurial albuminuria will last for a good many weeks.

Another condition, however, that may last only for a certain time in the day is one that is very serious to men who are going up for Public Offices. At nearly every examination for good appointments where there are a number of candidates, some of them, and occasionally those who are otherwise the most eligible candidates, are refused on account of albumen in the urine. Now, albumen occurs very frequently in young men and is known as the albuminuria of adolescence. The pathology of that form of albuminuria is not well investigated, but I had occasion to mention in some of my lectures before tha every man has to empty his urinary bladder three times a day, but he has got to empty his seminal vesicles, if he be a healthy man, about once in a month. That the seminal vesicles, on account of their peculiar formation may empty themselves all at once

or may empty one loculus at one time and another at another and so on. These usually empty themselves once a month of twice in a month or sometimes once in a week, so that a man has, like a woman, a monthly discharge. The centres for the genital organs and for the kidneys in the spinal cord are closely associated, and you will not unfrequently find, if you make enquiries, that the men who have been rejected for their posts on account of albuminuria have had a wet dream the night before. Therefore, in cases where you are consulted by such men and you find, as is generally the case, that they are told to go up again after an interval, you must take care that they do not go up again on the morning after they have had a wet dream, because if they do they will probably be rejected finally. Whereas, if you take the interval between the wet dreams, that is to say, especially if they get them once a month you take as nearly as possible the time between them, and you let the man go up then it is as likely as not his urine will be absolutely free from albumen and he will get through alright. By paying attention to this I have got several men through examinations and they have secured very good posts indeed, which otherwise they would have entirely missed, and the question is sure to come up before you some day of men going up for appointments and getting rejected on this account.

Now, the albuminuria of adolescence is closely associated with albuminuria of posture, but albuminuria of posture does not occur often in grown-up men, but it does occur pretty frequently in adolescents or in children, and this albuminuria disappears completely when the individual is kept on his back but appears again, to a positive certainty, when he is upright. The albuminuria here is just like the oedema of cardiac

disease. You know that if a man with mitral regurgitation lies on his back at night, all the oedema/goes from his legs, disappears completely. Well, in the same way, the oedema, as we may term it,goes from the kidneys, and the albumen disappears fromm the urine in these cases if you keep them on their backs.

E V I D E N C E by

SIR LAUDER BRUNTON, Bart.

I am a Doctor of Medicine of the University of Edinburgh, an Honorary Doctor of Medicine of Trinity College, Dublin, an Honorary Doctor of Laws in the Universities of Edinburgh and Aberdeen, Doctor of Science of the University of Edinburgh, Fellow of the Royal College of Physicians, London, and Fellow of the Royal Society, and of numerous Societies, medical and scientific, both at home and abroad. I am Honorary Physician to St. Bartholomew's Hospital.

For nearly forty-five years I have given much attention to the action of medicines, have lectured on the subject for nearly thirty years at the Middlesex Hospital and St. Bartholomew's Hospital.

I am the author of books on the Actions of Medicines, which have had a large circulation in this country and America, and which have been translated into French, Italian, German and Spanish.

I have had a very special training in experimental methods, having worked in the Laboratories of Professor Brücke at Vienna, Professor du Bois Reymond at Berlin, Professor Kühne in Amsterdam and Professor Ludwig in Leipsic.

I went in 1889 to Hyderabad to investigate the action of chloroform. At the request of Colonel Lawrie, the Nizam of Hyderabad had instituted a Commission, consisting of men in his own service, to examine into the action of chloroform. They reported that it invariably killed by paralysing the

respiration and not by affecting the heart. This conclusion was doubted and a second Commission was instituted, of which Colonel Lawrie was President and Sir Gerald Bomford, K.C.I.E., now Director General of the Indian Medical Service, was Secretary. I attended as the representative of the Lancet.

We made a number of experiments by giving chloroform to animals without any operation or without tying them up in any way. Every one of those animals died by stoppage of the respiration, and if examined immediately after death the heart was found to be beating. We thus completely confirmed the finding of the first Commission, that death from chloroform, per se, is due to stoppage of the respiration, but we felt that it was necessary to imitate, as nearly as possible, the conditions under which patients are when undergoing surgical operations. In operations thus performed upon animals we occasionally met with, just as occurs in surgical operations on man, instances where death appeared to begin with stoppage of the heart and not with stoppage of respiration. It was, therefore, clear that death could not be said to be caused by the anaesthetic, although it occurred during the anaesthesia.

Perhaps I may be allowed to give an illustration to make my meaning clearer. If a man is strangled in his sleep by a burglar, his death is not due to the sleep except in-so-far as the sleep prevented him from noticing the entrance of the burglar and possibly escaping. I have heard of a drunk man being drowned in two inches of water by falling on the road with his nose and mouth in a puddle. This man's death could only be said to be due indirectly to the alcohol he had drunk, although

it happened during intoxication. In the same way, death may occur from choking or, possibly, from shock, during chloroform anaesthesia. The death here is not due to the direct action of the anaesthetic, and yet it may have been induced by it, because the patient's unconsciousness hindered him from coughing and ejecting some substance which had entered his larynx and was choking him, or prevented the reflex contraction of the vessels, which in the waking condition might have saved him from shock.

Before the introduction of anaesthetics, many patients died from shock, but now such cases are rarely recorded. Almost the only case of death upon an operating table that I have ever seen was not due to an anaesthetic, but to shock. It occurred in the case of a man in whom the upper jaw was being removed for cancer. The preliminary incisions were made under chloroform and then the anaesthetic was allowed to pass off, lest the man should be choked by the blood from the wound running into his larynx. The operation was a long one, and it was only during the first few minutes that the patient was under chloroform. The pain which occurred after the anaesthetic had passed off caused shock, which proved fatal before the operation was completed. But death through shock may happen during partial anaesthesia, and the period of danger usually is before the anaesthesia has been completely established, or just when it is commencing to pass off.

There are certain arrangements of the nerves and circulation in the body which tend to prevent death. When consciousness is complete, they all act together and fulfil their function well. When consciousness is entirely abolished, no one acts more than another, and, again, there is little risk. It is when the relations to one another are disturbed in imperfect anaesthesia that danger comes in.

Perhaps I ought to say that in the action of anaesthetics, four stages may be distinguished. One is the stimulant stage, where all functions, bodily and mental, seem to be increased. This is best observed after a moderate dose of alcohol or a few whiffs of chloroform. Next comes the narcotic stage, when the relations of man to the external world are impaired. He is no longer completely conscious of what is going on, nor can he direct his movements with the same precision that he would when conscious. The third stage is the anaesthetic stage, when consciousness and voluntary motion are completely abolished and only the heart and respiration go on uninterruptedly. The last stage is the paralytic stage, when the respiration and circulation also become affected, the breathing stops and the heart ceases to beat. These stages occur more or less in the action of all the anaesthetics. In the case of some, like alcohol, the stages are prolonged and a very large quantity of the substance is required to produce the paralytic stage. It is therefore very easy to stop the administration of the drug at any time, so as not to prevent one stage passing on to the other. In the case of chloroform, on the contrary the action is quickly produced, the stages succeed one another rapidly and considerable caution is required to prevent one passing into the other. Alcohol is, therefore, a much safer anaesthetic than chloroform, but it is so slow as to be inconvenient. Chloroform, on the other hand, is very rapid and very convenient, but its administration is not without a certain amount of risk.

Various anaesthetics, such as ether or a mixture of ether with chloroform, usually known as A.C.E., chloride of ethyl, etc. have been employed with the idea of finding one which was more convenient than alcohol and safer than chloroform.

Many organic substances have been used, and the one which has found most favour is ether. Alcohol, ether and chloroform, in all probability, produce their effects by acting directly on nervous tissue, but chloroform, in addition to acting on the nerves, also acts on every other tissue of the body and especially upon the heart. If applied to the skin, chloroform will blister it. If it be injected into the arteries of a limb, it will destroy the vitality of the muscles and render them as hard as a piece of board. If a frog's heart be dipped into it, it will become rigid, like any other muscle. If blown into the lungs by artificial respiration, chloroform may stop the heart, but if inhaled in the ordinary way the respiration fails first and thus the inhalation of chloroform stops before enough has been taken in to stop the heart. But, whenever respiration ceases, the heart is bound to stop a little while afterwards, and if the cessation of respiration be caused in other ways than the mere administration of chloroform, the heart will also stop.

Now, the respiration may be impeded by the tongue falling back so as to cover the opening of the windpipe, or by blood or saliva flowing into it when the patient is too deeply over to cough. A heavy weight, such as that of the arms of an assistant pressing upon the thorax or abdomen, may prevent respiratory movements. Or a spasm of the glottis, due to blood, saliva or regurgitated food, may cause the vocal cords to close and prevent the ingress of air. Spasm will not occur when the patient is thoroughly under, but will happen when he is only partially under, and probably this is one of the reasons why imperfect anaesthesia is dangerous.

I well remember the dictum of my old teacher, Professor Syme, who said that we never had had any deaths from chloroform in Edinburgh, and the reason was we always used the best chloroform and gave plenty of it. By using pure chloroform, spasm of the respiratory passages, due to the irritating fumes of impure chloroform, is avoided, and by giving plenty of it surgical shock is averted.

There are two ways of giving chloroform, one is to begin with it very dilute and gradually increase the strength of the vapour by holding the inhaler nearer and nearer to the nose, so that the patient passes gradually into a state of unconsciousness. The other is to cram an inhaler, saturated with chloroform over the patient's nose, and hold it there. Oddly enough, both those methods seem fairly free from danger, and it is a mixture of the two that does most harm; such as beginning gently and afterwards cramming on a lot of chloroform when the patient is partially under.

Rabbits are very apt to die under chloroform, unless it is given with very great care; yet in the Pasteur Institute the quick method is almost invariably adopted. A sponge soaked with chloroform is held before the rabbit's nose, it stops breathing for many seconds, then takes a deep inspiration, and at once falls into a state of profound anaesthesia. I have myself taken chloroform by both methods, either for extraction of teeth or for surgical operations, and I certainly much prefer that of gradual inhalation. When the inhaler with concentrated vapour is held before the nose, the difficulty of breathing becomes most oppressive, and leads to most violent exertions being made in order to tear away the mask and get a breath of air.

From the fact that ether is less dangerous than chloroform, one would think that it should be universally employed, but it also has its disadvantages. It does not act so quickly, it is less pleasant to take, and has the disadvantage that it is more apt than chloroform to cause unpleasant after effects, such as persistent vomiting or the occurrence of bronchitis.

The difference between ether and chloroform in anaesthesia is very much like the difference between a blunt and a sharp knife in the surgeon's hand. Unless accurately guided, a sharp knife is the more dangerous, and if it slipped would do more mischief than the blunt one, and yet the advantages which the sharp knife possesses when properly used are so great as to make surgeons invariably prefer it to a blunt one.

Another anaesthetic which is very useful for short operations is nitrous oxide. The stimulant action of this gas, when only a few whiffs of it are taken, is so extraordinary that it is generally known under the name of "laughing gas", but when steadily pushed it produces complete anaesthesia. The disadvantage of it is that, owing to its preventing the proper oxidation of the blood, the patient becomes completely cyanosed and the an anaesthesia can only be continued for a short time. By mixing oxygen with nitrous oxide, the anaesthesia may be kept up for a longer time. If care be taken to allow the respiration to go on easily and completely during inhalation, nitrous oxide is almost completely free from danger, but even, with it, it is to be remembered that shock is more liable to occur in an upright than a more or less recumbent position. A method which is now frequently employed is to begin with nitrous oxide and go on to ether.
As I have already said, in all anaesthetics there are the four stages of action to be distinguished.

There are other drugs which also abolish pain, but are not usually classeduas anaesthetics, because the narcotic stage is the more marked. More especially it is the case with opium, which in small doses is a stimulant, and in large doses is a narcotic, disturbing the relationship between man and the external world, and then producing profound sleep with complete unconsciousness to pain; so that an animal entirely under its influence might be cut to pieces without making the slightest movement or indicating the least sensation.

Morphia is a convenient anaesthetic for animals, but it is not convenient for man, because the quantity required to produce anaesthesia would also be sufficient to cause danger. The pain would be quite abolished, but the patient might never awaken from the state of unconsciousness. It is, however, a useful adjunct to ether or chloroform where the operation is to be very long, and especially in such cases as I have already mentioned of excision of the jaw, where the anaesthetic cannot be continued during the whole operation. In cases also where an anaesthetic cannot be administered, a subcutaneous injection of morphine may prevent much pain. For example, I was told by a German Professor that when serving in the War of 1870, he was stationed beside the ambulance waggon which was to convey wounded men from the field to the hospital at the base, and as each wounded man was lifted into the waggon he received half a grain of morphine by subcutaneous injection. This quickly took effect and the wounded men, having been saved the excruciating pain they would otherwise have experienced in being carried to the hospital, arrived in a much better state for the amputation, orother operation to be performed than they would have done without the narcotic.

Laughing gas, ether, chloroform and morphine, probably prevent pain chiefly by deadening the sensorium in the brain. Other drugs prevent pain by acting either on the nerve fibrils at a point of injury or the spinal cord through which the painful impulse has to travel before it can reach the brain.

There are a great number of drugs which have a more or less local anaesthetic action, but in many of them this is combined with an irritant effect which prevents their employment. The most important local anaesthetic is cocaine, and various modifications of this drug, such as eucaine, holocaine, novocaine, stovaine, acoine and orthoform. These are employed in solution by applying them to the part as in the case of operations on the eye, nose, throat, gums or other parts where the solution can be easily applied, or by injecting them subcutaneously where an incision has to be made, as in the case of a boil or abscess, or into the gums for dental purposes. The action of the local anaesthetic has been found to be increased by mixing it with a solution of adrenalin which contracts the blood vessels. Local anaesthesia has also been produced by putting the positive electrode of a battery soaked in a solution of the cocaine on the part and placing the negative electrode on some other part of the body. The connection then passes through the skin and subcutaneous tissue and produces local anaesthesia.

Another method which has lately come into vogue is to inject solutions of local anaesthetics into the spinal canal. These act locally upon the spinal cord and prevent the transmission of painful impression made upon the nerves below the point of injection to the brain in much the same way as cutting a telegraph wire stops the transmission of messages by it.

I cannot give the relative mortality of operations conducted on this method, as compared with those of general anaesthetics. I believe it is upon the whole rather high at present,, but it is quite possible that with the increased knowledge and improved methods, this method may be preferable to general anaesthesia, at all events in some cases.

I do not feel qualified to speak in regard to the provision made at the Hospitals for teaching anaesthetics to students. At St. Bartholomew's Hospital I believe it is very good, but I cannot answer for the others. It seems to me that the position of the Administrators of Anaesthetics at a large Hospital is lower than it ought to be, because in the list of Medical and Surgical Members of the Staff they come last of all those holding permanent appointments.

In regard to the proposed legislation, I may say that, in answer to the question:-

> "Are unqualified persons to be prohibited from administering general anaesthetics for operative purposes?"

I think such universal prohibition is totally impracticable. A sweeping law of this sort would at once prevent all students from administering anaesthetics until they had passed their examinations, and it would therefore be necessary for men to undergo a special course in anaesthetics after they had received their qualifications, and not before. Moreover, in country practice an accident may occur, the Doctor is sent for, and he may have to amputate a limb. There may be no qualified person there, and it may be impossible to get one; somebody must give the anaesthetic or the patient must undergo the operation without it. Again, in cases of excruciating pain, such as we find in angina pectoris, or in gall stones and in some neuralgias, it is not always convenient or safe to use morphine, and then I am accustomed to give directions for the patient to inhale chloroform in a manner which I first learned from the late Mr. Image,

of Bury St. Edmunds. A piece of blotting-paper is put at the bottom of a tumbler, a few drops of chloroform are thrown upon it, and the tumbler is then inverted, so that there shall be no chloroform in the tumbler beyond what is soaked up in the paper. The patient then inhales from the tumbler. As soon as the anaesthetic begins to take effect and the pain becomes easier, the patient falls asleep, his hand drops, and the inhalation ceases. Whenever the effect passes off and he awakes with the pain, his hand is then again raised and the chloroform is again inhaled. The pain in many of such cases is liable to come on at any moment without warning, and may last a long time. It may be perfectly impossible to get a Doctor for hours, either to give or to supervise the administration, and it seems to me a cruelly wicked thing to prevent patients getting relief in this way. In all probability none of them would ever dream of doing it except by the direction of a medical man, but it might be absolutely impossible for the Doctor to supervise the administration. In cases of labour also the same thing would occur. In country districts where the Doctor has to ride many miles between one patient and another, it may be impossible for him to wait all the time beside one patient or to supervise the inhalation of chloroform, but if it be given in the way I have indicated and his directions followed there would be no risk at all. The only risk is that too much may be put into the tumbler, or that the patient may get hold of the bottle so that the chloroform being spilled on the pillow the patient ~~xx~~ might lie down and receive a fatal dose.

It seems to me that Dentists, as a rule, are quite as well qualified to give anaesthetics as ordinary medical men, in fact, in many cases, I think they are better qualified.

I do not think that there is any need for legislation for the application of local anaesthetics to any external part, but I think that anaesthesia by the injection of anaesthetics into the spinal canal should only be done by thoroughly qualified men.

A Case of Aneurism.

Clinical Lecture.

Delivered Friday July 8th.1898.

Clinical Lecture. Delivered Friday July 8th.1898.

Gentlemen:- The case to which I wish to draw your attention to-day is one that has been a good long while in Rahere Ward, and the diagnosis of it has been very uncertain. The patient was a man named George Henderson, aged 31, a labouring carman. This work of course involves great physical strain, because carmen as a rule have to lift things off and on to the cars, and sometimes the things are of great weight, and thus great strain is put upon them. He had apparently been quite a healthy man and had expecially never suffered from syphilis, which is a most important point, inasmuch as the disease from which he suffered is a very common consequence of syphilitic infection, but his statement is borne out by the post mortem examination, because his vessels although, as you will see, very extensively diseased, were free from atheroma. In most cases we find that early atheroma is a consequence of syphilis, and that the atheromatous disease leads afterwards to disease of the vessels such as aneurysm. This man was free from disease and apparently been perfectly health until January 1897, a little more than a

year ago. He then suffered from pain in the legs with swelling in the shins, and for this he was laid up during six weeks, and afterwards he continued well till May 1897, when he was admitted into Colston Ward with pain in the chest. On examination he was found to have a mass in the abdomen, and while in the ward he passed blood in his urine. The pain in the chest was ~~seated~~ situated across the amento sterni on either side and was relieved by treatment. After this he remained well I think until five weeks before admission into Rahere Ward. On January 24th 189 when in Colston Ward under Dr Hensley, it was noted that he complained of pains in the chest and back for twelve months before admission, and this was put down to rheumatics. There was then a large tumour filling up almost the whole of the left half of the abdomen. This was covered in front by intestine, which gave it a tympanic sound. There was no murmur on auscultation. To the right it shaded indistinctly off under the recti downwards; it descended by a somewhat rounded edge to the brim of the pelvis. To the left it descended into the loin and was felt at some depth by , afterwards; it descended under the left ribs. Its surface could not be plainly made out, but there was a ridgy nodular feel about it; there was a well-marked notch as in the spleen. Its consistence

seemed to be almost as hard as that of a brick, irregular in shape, and somewhat rounded, and then here comes a very important thing, "it transmits the aortic impulse all over; it is somewhat mobile but not much, being moved about by but not to a great extent; some pain with it especially on percussion of the spine". The diagnosis here, as noted at the beginning of the case, is that the man is suffering from disease of the heart. He had a systolic apex bruit with a diastolic basic, which would seem to point to a mitral regurgitation and aortic regurgitation; he had also haematuria, and a tumour giving a sense of pulsation. This is what is noted in the Case Book, but I believe that in discussing the exact character of the disease the diagnosis was doubtful and was considered to be probably either a tumour of the kidney, malignant in nature and receiving an impulse from the aorta, or else possibly to be a dissecting aneurysm. When the man was admitted into Rahère Ward he presented a condition which is perhaps more easily distinguished if I give a diagram of it. The cardiac dulness was considerably increased and began at the right of the sternum and passed well onwards and downwards to the left, nearly to the nipple line. There was over the aorta a long soft diastolic murmur; there was also a rough, loud,

somewhat presystolic murmur. The breath sounds were weak on the left side, as if there were something interfering with the bronchus on the left side. The most marked thing however about the condition was the large tumour in the abdomen which passed out very much in the direction shewn and which I did not think was covered by intestine; at any rate it seemed to me that the greater part of it was not covered. This mass felt hard and nodular; there was a depression which might have passed for the spleen, though somewhat indistinct, but what struck one about it was the strong impulse which it received at every beat of the heart. This was so strong that it seemed doubtful whether it was possible to be simply a tumour lying upon the aorta and iliac and projecting forwards at each beat. It was so strong that one was inclined to think that the tumour was really an aneurysm. It was so much to the one side that it hardly looked as if it were possible for it to be an aneurysmal dilatation either of the aorta or of the iliac artery It would seem to me more likely to be the false aneurysm, where the blood had escaped from the aorta and formed a sac by tearing through a great deal of connective tissue and thus forming a coating to itself, and that this had received the impulse at each beat of the heart. The diagnosis was therefore

a very uncertain one, and we were not much aided by the fact that there was a considerable mass of dulness just at the lower part of the back. It was clear that there was cardiac mischief, but it was not exactly clear how far this was an aneurysm. There was a murmur at the apex also a systolic murmur just inside the nipple line. These conditions I believed indicated aortic obstruction, aortic dilatation and possibly also a certain amount of mitral regurgitation, but assuming that such did exist they did not explain everything, for example, the weakness of breathing which was heard over the left side. So that upon the whole one came to the conclusion that there was a dilated aorta possibly with some atheroma, and that this had given rise to incompetence of the valves with dilatation and hypertrophy of the heart and secondary incompetence of the mitral valves; that very probably there was also a sacular aneurysm pressing upon the left bronchus, so that the sounds from the left lung were weak. This latter was borne out by the fact that the patient suffered a good deal from haemoptysis, and it being pretty profuse. The diagnosis then was that there was cardiac disease, aneurysm, and a lump in the abdomen the nature of which was still doubtful. It might be a case of false ~~[illegible]~~ aneurysm, or it might be that the lump was altogether unconnected with the condition of the thorax, and that it really

might be a malignant mass pressing upon the artery. There were two difficulties in the way of either diagnosis. The difficulty in the way of supposing this to be a malignant mass was that the impulse seemed to be partially transmitted outwards and not simply upwards. It did not seem to be quite an expansile pulsation in the ordinary sense of the term. The mass did not seem to dilate under the influence of the cardiac systole, but it seemd to be moved at the same time forwards and outwards to the left. The other difficulty was that it did not seem to increase with much rapidity in the way that malignant disease ought to have done.; so that although I was at first disposed to believe it to be malignant I latterly came to the conclusion that it was more likely to be aneurysmal. The hardness might be one or the other. It showed us that it was not a simple sacular dilatation of the aorta, but that it was either malignant disease, or it might be due to aneurysm in the process of cure, the aneurysm being to a great extent filled up with clot. I have here a section of a clot from an aneurysm and you will see that the outside is quite rounded, the inside is just like a number of layers of shoe leather superimposed one upon another, and if you feel the edge you will find that it gives the hand a sensation of hardness very much resembling that which was indicated to the hand by the mass in the patient in question. The

difficulty in receiving the conclusion that it was due to aneurysm was this: The size of it was enormous. I went up to the Museum to see a case of false aneurysm, but when I came down I thought surely this case cannot be one of false aneurysm because it is so much bigger than anything in the Museum. At the same time as the case went on I began to think of another possibility. It occurred to me that this lump might after all be spleen, although it seemed to be absolutely unlike ordinary spleen. In ordinary cases the spleen is smooth in surface, it has a sharp, hard, definite edge and a well marked depression at one point. But in a case of ulcerative endocarditis with numerous embolisms I have found a spleen which one could hardly distinguish from the mass in Henderson's case. In that the spleen was nodular, on the surface it was rough instead of smooth, the edge was thick and rounded instead of being sharp and the could not be very well felt, so that the nature of this condition remained very doubtful. We had three diagnoses, namely, false aneurysm, malignant disease spleen enlarged by numerous infarcts, and up to the end I confess I was not quite clear which it was.

(Dr Smith's particulars as to the condition of the patient when he was dying)

"He had a sudden attack of pain on Tuesday evening and when I got to him he was quite pulseless at the wrist and had all the signs of having ruptured his aneurysm. His respiration

continued for sometime after he became pulseless and he died in about an hour, having acute pain in the chest nearly all the time."

Before going further there is one thing I ought to have mentioned before, namely, that there was a good deal of dulness at the left back, absence of vocal frematous, absence of breathing sounds, and I hesitated about putting in a needle there because I felt strongly convinced that there was an aneurysm, and I did not like the idea of running a needle into it. However, Dr Smith thought it was advisable to put a needle in and he did so and got out some clear serous fluid. The aspiration was not done at that time, and a few days afterwards I put a needle in at a different point. I was very much afraid of this aneurysm which I expected to lie pretty near to the spine and I thought if I put the needle in close to the spine I may run into the aneurysm, and so I chose a point nearly three inches further out than where Dr Smith had introduced the needle. Whether it was that the aneurysm had been dilated in that direction or the needle that I used was a longer one than that used by Dr Smith I do not know, but I got out pure blood, and after withdrawing an ounce or two I closed the wound up. I am glad to say that the withdrawal of the blood

from what must have been the aneurysmal sac did the patient no harm, indeed he felt better after, but there was no real improvement and he gradually sank.

As regards treatment, it was simply directed to keep the pain under by means of opiates. The death indicated one would think that the aneurysm had burst somewhere, and one would have expected to find a good deal of blood extravasated. I am sorry to say that the post mortem has not quite cleared up where the blood was, and why the man died when he did, but it has cleared up the conditions that were observed during life,

The heart was a good deal hypertrophied, but the valves were normal. There was apparently no reason for the murmurs that had been heard at the base. Now the reason of that is this, and I ought to have mentioned it, that these murmurs were very variable in character, sometimes present, sometimes absent, and that was another puzzling factor in the case. When there is a systolic and diastolic mumur at the aortic orifice, it is generally fairly constant. It may vary in amount, but it as a rule does not entirely disappear. The presystolic murmur was probably due to some sort of kink or pressure upon the auricle leading to some interference with the passage of the blood from the auricle to the ventricle. The disatolic murmur was due to the aorta having been so much dilated. The weakness

of breathing was in all probability due to the pressure upon the left bronchus by the large aneurysm, and the swelling down below was due really to a false aneurysm, which was filled with clot. The clot however was not of the laminated character that I show you, but was of a somewhat less friable character. I should think it is one of the largest aneurysms that has been put on record, and it seems to be very extraordinary in its nature as well as its size. because there is no atheroma. There are openings in the inner coat of the aorta and the aneurysm seems to have dissected between the coats of the aorta and formed this aneurysmal bag. The nature of this large sac I cannot tell you as yet, because it is not yet completely dissected. There is one point about the case that perhaps is useful in diagnosis. Before the man died his apex beat had travelled across and the heart could be felt beating at A. instead of the normal position. Now, such a dislocation of the heart is very unusual and you generally find it either when the heart has been driven across by large effusion into the other pleura or else by contraction in cases where the effusion has been present and it has got gradually absorbed with shrinkage of the chest. In this case, however, there was no shrinkage of the chest todraw the heart across and we knew it

was not driven across by the accumulation of fluid in the left pleural sac, because there was comparatively little dulness and one could hear all over the left side the breath sounds quite loud and distinct. The weakness that was at first noticed in the sounds of the left lung had before death really quite disappeared, and the sounds were quite loud and quite clear in the left lung. So we came to the conclusion that the heart was being driven across by some unusual condition - by the dilatation of the aorta - which had ~~pressed right away~~ pressed it right away out of its ordinary place. I do not know how far the idea that I had formed of the condition during life is right, but this was what I had imagined to have occurred. I supposed that there was a large sac at A. and this had driven the heart over to the other side, that there was a little fluid close to the sternum and this was withdrawn by the first needle, that the large aneurysm extended considerable outwards and that I had run the needle from the external part right into the sac of the aneurysm and thus tapped it and withdrawn blood. The whole case is, as you see, then one of very unusual character. That, although the symptoms and signs indicated pretty clearly that there was a large thoracic aneurysm, one was by no means certain as to the nature of this large

tumour in the abdomen. Even if such a case were to occur again to-morrow, I think it quite likely that one would again be in great doubt as to the nature of it. At present I do not see any very definite means of distinguishing between a case of malignant disease pressing upon the aorta and a case of infarct in the spleen or a case of false aneurysm; in fact I should think the only way to distinguish between them would really be to make an exploratory incision into the abdomen. Now, supposing this had been done in our case, would it have been beneficial or harmful? Have we left anything undone that would have been useful to this patient.? I do not think we have. If we had made an exploratory ~~xxxxxx~~ incision into the abdomen we would very likely have got no definite result, because when the abdomen was opened first of all this mass was taken to be an enlarged kidney and afterwards the kidney was found to be right behind it. I think it is quite likely that the mistake that was made when the abdomen was opened post mortem would very likely have been made if it had been opened during life, because it was not until a great deal of digging and separating the tissues that the left kidney was found at all.

I do not think we should have gained much even from a diagnostic point of view, and I am quite sure we would have gained

nothing in the way of treatment. Looking back over the case, there was nothing whatever to be done except to meet all the symptoms as they arose, and the main resource in such cases really is opium. There was one little effect with opium that was somewhat troublesome here. You know that opium is excreted, like many other things, into the mucous membrane of the stomach; that if you inject a lot of opium into the veins of an animal or into the subcutaneous cellular tissue of the stomach, you will be able out of the scrapings to get opium which can be recognised with the characteristic tests. The opium partially undergoes change and the morphine is converted into oxidi morphine or apomorphine, both of which are powerful emetics and in small doses tend to cause nausea. Now, in this patient there was a good deal of nausea, and I ~~expected~~ suspected that ~~that~~ this was due to the excretion of oxidi morphine or of apomorphine which had been formed in the organism from the opium or morphine given to allay his pain, and which was thus acting upon the stomach as an irritant causing nausea. In such cases it is the best thing to give the patient plenty of hot water to drink which makes him sick and the stomach gets washed out and the patient feels comfortable. We found in this case that letting him wash his stomach out in this way, and drinking a little champagne afterwards that the sickness was soothed and he was helped a good deal.

ANGINA PECTORIS

Clinical Lecture delivered by Dr. T. Lauder Brunton, F.R.S., at St. Bartholomew's Hospital on Friday March 17th, 1899.

Gentlemen:- Yesterday in the post mortem theatre you saw the post-mortem of a case of cardiac disease. If you had been in the Wards before you would have seen that this patient was suffering from intense dyspnoea, coming on in paroxysms. During some of these paroxysms the patient suffered also from pain. His case was not one of typical angina pectoris, and yet in some respects it was very like angina pectoris. The difference between the paroxysms from which he suffered and those observed in a typical case of angina pectoris consisted chiefly in the fact that there was more interference with the respiration and less pain than is common in angina pectoris. But the likeness between his symptoms and those of angina have prompted me today to take up this disease as the subject of my lecture.

Angina pectoris has been defined as suffocative, breast pang and I do not know that one could define it better. It is very difficult to define angina pectoris, because it is not a disease; it is a symptom. If you try to define Asthma,

you will find it is not very easy, because Asthma varies so much in its position, in its intensity, in the nature of the pain and in its radiation, so that it is not very easy to get a definition which will include everything. Now, angina pectoris is somewhat of the nature of toothache, in-as-much as there is intense pain, but it is associated with other symptoms which sometimes predominate to such an extent as to throw pain really into the background. These symptoms usually may be classified under the head of "suffocative." Now, suffocative has two distinct, entirely different feelings. These are very hard to describe, but you will understand them more easily by a very simple experiment upon yourselves. Take your handkerchief, hold it to your nose and keep it there until you feel the desire for breath to be overpowering, so that you must take it away. You will find then that there is a distinct discomfort in the chest, but it is of a different nature from the one which you can produce by another experiment. Press your thumb backwards and inwards over your carotid, press it hard against the cervical vertebrae. In this way you will press not merely the carotid but the vagus and probably also

the sympathetic nerve, and you will then get a feeling of suffocation, quite as unbearable as that which is produced by holding your handkerchief before your nose but having a very different feeling. The feeling, then, is one of intense compression over the chest which seems to drive the chest in, and at the same time prevents you from drawing a breath, although your passages are perfectly open, and there is no reason whatever why you should not take a deep breath. It is the difference between those two senses of suffocation that have led to a great deal of dispute about angina pectoris. Just as toothache, angina pectoris varies very much in degree, from a slight pain, which is hardly to be observed, to the most intense agony. In nearly all cases, even when it is slight, it appears to be accompanied by a feeling of oppression. You will understand the difference between the pain alone and the pain accompanied by oppression if you consider that even in the very slight cases of angina the patient on walking up a hill is almost always obliged to stop. If you ask that man afterwards whether the pain in the chest has been as severe as the pain of a twisted ankle or even the pain of an inflamed toe, he will probably tell you that it has not been nearly so severe.

And yet in spite of a twisted ankle or an inflamed toe a man may walk up hill without shewing almost any sign of wishing to stop, but it must be the oppression rather than the pain that makes the man stop and makes him feel that he cannot go on in spite of this pain. In the severer cases the pain comes on not merely after exertion, but without almost any apparent cause and it becomes much more severe in its nature. In the slight pain which occurs in commencing cases, the duration is short, the intensity is slight and the recovery is rapid. After stopping for a minute or two, the patient feels better and may sometimes be able, without much discomfort, to resume the walk. Moreover, if the pain is so slight that he is able to persevere in spite of it, it very often happens that the pain will pass off and the man will be able to go on walking afterwards without the least discomfort. But when the pain becomes severer the man is obliged to stop still and sometimes he is unable to make any movement whatever. If he is standing when the pain takes him, he will try and lay hold of something and will rest against it so as to take off any weight upon his chest. If he is lying in bed, the chances

are that he will raise himself to a sitting posture and then will lean his hands against his knees so as to support himself in that posture, which is so frequently observed in the wards in cases of aneurysm. In these severe cases you generally find that the face has an anxious distressed look; sometimes the look of distress is exceedingly great. The face as a rule is pale, sometimes the lips may have a slightly livid tinge but the paleness is more marked than the lividity. The cheeks look a little sunken, and the surface of the skin is very often cold and covered with sweat. If you notice the respiration it is usually hurried and very short - little quick gasps, the patient feeling that he cannot expand his chest and yet if you tell him to take a deep breath he will probably take one with perfect ease and feel all the better for it. These symptoms come on very suddenly, last only a short time and pass away suddenly. In other cases they come on suddenly, last over a period varying from several minutes to two or three hours and then they may pass away either suddenly or gradually.

The site of the pain is usually in the lower part of the sternum, but frequently you will find it in the upper

part and sometimes more to the left, nearer to the apex of the heart. Occasionally the pain as it passes off will leave the left part of the chest while it still remains to the right side of the sternum, and in severe cases it almost invariably radiates to some extent, generally down the left arm, sometimes down the right, sometimes down both and sometimes up the neck as well. If you feel the pulse during this condition you will find it is almost always small. Some men have stated that it is unaltered in strength or rhythm, but this, although it may possibly occur sometimes, is not a usual condition. You will find if you take a sphygmographic tracing of it that the pulse is generally very small and on feeling it you will observe that the pulse wave is very slight. Occasionally the pulse is slow but generally it is quick, not unfrequently it is hard and somewhat difficult to press.

Now, these cases of angina pectoris have two causes, predisposing and exciting. They occur more commonly in men than in women and they almost always occur after middle life. You will notice, however, that in perfectly young people there may be symptoms very nearly simulating those of true angina, Just as in a perfectly healthy girl there may be the symptoms

of paralysis, so there may be in a healthy girl the symptoms of angina pectoris. Angina pectoris is usually divided into two classes, the true and the false. The true is a very serious, often fatal disease; the false is generally recovered from completely. It really comes to be this that the true angina pectoris, such as occurs in men beyond middle life, is a disease characterized by more or less definite lesions, having a course which almost invariably tends towards death, while the symptoms, apparently almost identical with this true disease which are observed in young girls, have no definite physical basis and may be looked upon as hysterical. Moreover, the treatment which cures or relieves the true disease is of little use in these cases of hysteria.

The predisposing causes of angina are syphilis, gout and rheumatism and added to these is the very important one of age. Syphilis leads to endarteritis and so tends to render the arteries thicker, more friable and more liable to become blocked. Gout has a somewhat similar action, and tends, moreover, to affect the kidneys and give rise to a high arterial pressure, while rheumatism affects the valves of the heart, and by the changes that it induces there it tends to block the

coronary arteries. The lesion above all others which is associated with angina pectoris is narrowing of the lumen of the coronary arteries, and it would appear that the reason why this is associated with angina is that when the heart is called upon to make any extra exertion it requires, like other muscles, an extra supply of blood, and when the coronary arteries have their lumen lessened this extra supply of blood is not forthcoming, and then you get some affection in the muscle or in the nerves of the heart which leads to the symptoms which we know as Angina. This narrowing of the lumen may occur either in the coronary arteries supplying the right or left ventricle, but it is when the arteries supplying the left ventricle are affected that we get the symptoms of angina. If the arteries supplying the right ventricle are affected, a different class of symptoms is produced, to which the name of "cardiac asthma" has been given. The man is short of breath on the very least exertion, while his lungs are perfectly healthy, but he does not as a rule tend to suffer from severe pain.

These then are the predisposing causes. The actual cause of an attack is generally some call upon the heart for

extra exertion which is made either by some unwonted effort or by some unwonted emotion. The effort which most frequently brings on the attack is that of walking up-hill and more especially when this is attempted shortly after a meal. Different emotions tend to bring it on also, but the emotions do not tend to bring it on in the same degree. The softer emotions, pleasure, affection, love and so on do not appear to have the same effect on bringing on an attack, unless they should be very sudden and very excessive . Sometimes great joy affecting a person suddenly and unexpectedly has caused sudden death, but joy as a rule does not kill, whereas anger very frequently does. You probably know that John Hunter suffered from angina pectoris for a number of years before his death, and that he was accustomed to say that his life was at the mercy of any rascal who cared to irritate him. The end of his life was that one day at a Committee Meeting he was suddenly contradicted; he left the room, staggered into an adjoining apartment and fell down dead.

Time will not allow for anything like a full discussion of angina pectoris, but I must say a word or two about the diagnosis. In cases of hysteria there is a choking –

a suffocation - which may lead you at first sight to say that the patient was suffering from angina pectoris, more especially as that patient might at the same time complain of pain over the cardiac region. But such cases, to which the name of hysteria is given, and the globus hystericus, generally point to the throat as the place where the difficulty of breathing exists, and these cases are observed in young women. On examination of the heart, you will find that it is perfectly healthy, and you have no reason to suspect that there is anything the matter with the heart. In the elderly men who come to you complaining that they have got a little weight or pain after exertion, - very often, as I have said, at the lower part of the sternum or the upper part of the sternum - what you must look ~~fax~~ out for very carefully is a sign that you would be very likely to miss if you were not looking for it, and that is an exceedingly slight murmur just over the aortic area; just over the junction of the second right costal cartilage with the sternum, sometimes going a little up the vessels. If you get this sign along with the ~~pain~~ complaint of pain over the cardiac region on exertion in a man over 45, then you require to take a somewhat careful view of his case. You enquire then also if he has had syphilis, because if so it makes the case

still more grave. You enquire also into the history of his life; whether he has been given to athletics, more especially in later years, because athletic exercise when a man is young does not do so much damage to his arteries, but athletic exertion beyond a man's strength, when his arteries are beginning to get a little rigid may do a great deal of harm and may apparently lead to more mischief. The history of the case - the sudden causation of the pain, the apparent difficulty of breathing, the paleness, the cold sweats, may be simulated by other things because you may get some similar symptoms coming on from the passage of a calculus down the ureter or the passage of a calculus through the bile duct. The difference here is that in the passage of the ~~xax~~ calculus the pain, as a rule, radiates downwards towards the bladder or towards the genitals, and the pain of a calculus passing through the gall duct tends to radiate more or less laterally, sometimes a little ~~dxxxaxdxxx~~ downwards towards the umbilicus, sometimes even a little upwards towards the shoulder, but generally towards the right shoulder but not down the arm. There are some cases of hepatic biliary calculi in which it is very difficult to diagnose whether there is angina pectoris or not, because in these cases where the two things coincide, a calculi in the bile duct and a weak heart, the radiation of the calculi passing through the bile duct may

give rise to some symptoms of cardiac failure which you are at first inclined to attribute to the heart itself.

I will now refer shortly to the treatment. First of all, you must take care that the patient who is sufferung from true angina pectoris shall be very careful in any exertion he takes that any exertion shall not be sudden. If you take a string and try to break it, you may give a great deal of pulling without breaking even a weak string, but if you give a jerk, the string goes at once. Now, in telling such patients what to do, you advise them to begin to do everything very slowly. The rule that I give to them is this; a very short prescription, but very hard to get made up sometimes:-

"Don't hurry.
Don't worry"

Many patients say they can do the first but not the second. You should then tell them the story of the Irishman, who said, "Be aisey boys, be aisey, and if you cannot be aisey be as aisey as you can." It is very important that, as far as possible, they should carry out the two rules I have given. They should begin to walk slowly and should never commence walking immediately after a meal, but should rest for half an hour before undertaking any exertion. They should take gentle regulative exercise, but not sufficient to bring on the pain. During the attack

the best way of cutting short the difficulty of breathing and the pain is to let them inhale some nitrate of amyl. They can do this from a bottle or a capsule. Hot applications should also be put to the hands and to the feet. Nitro-glycerine is more convenient than Nitrate of amyl and acts almost as well. You tell your patient to keep in his waistcoat pocket a small box or bottle containing the tabloids and as soon as the pain comes on to begin to nibble one. If the pain is acute he breaks it up quickly in his mouth and swallows the whole. If the pain is not very acute, he may take instead of a whole one, only a part of one. There is another drug which has a somewhat similar action, nitro-erythrol, but it is more permanent, so that you may give half a grain of it three times a day with great advantage as a prophylactic, tending to keep the attacks off. In some cases where the pain is very excessive and where it is not seeming to yield to the nitrates, you may then give a hypodermic of a third or half a grain of morphia. The drug which of all others is the best for removing the cause of the attacks of angina pectoris is iodide of potassium, and you give this in doses varying from five to fifteen grains three times a day. A good plan is to give it for ten days or a fortnight

at a time, leave it off and then begin again.

I have been obliged to go through this subject very quickly and have only cursorily touched on the chief points.

DEMONSTRATION on THE MEASUREMENT of

BLOOD PRESSURE.

Given by Sir Lauder Brunton, M.D. F.R.S. at The Polyclinic Chenies Street, W. on Tuesday, May 1st, 1906.

Ladies and Gentlemen:- I am not going to give you a lecture today but a demonstration and in looking over the apparatus that I have here I cannot help thinking of what occurred when I was a student in Vienna many years ago. I attended a class on Diseases of the Larynx and the professor used to bring up day after day a large number of apparatus and he lectured upon them, but at the end of the course he said:- "I have shewn you a great many apparatus all of which are entirely useless; we will now proceed to attend to the apparatus that one would actually employ". I shall take the next course, viz., I will show you some apparatus that is sometimes useful but which is more especially useful in laboratory work for experimental investigation. Afterwards, without wasting very much time, upon them, we will come to the apparatus that one wants to use and, as I find now, needs to use every day and almost as constantly as the stethoscope. Although I shall only give a demonstration upon Blood Pressure, I think it may be worth while for me to make one or two introductory remarks.

We are accustomed to speak of the heart as an unresting organ. I do not know how many of us actually remember that the heart rests for 13 hours out of 24 during which time it is perfectly quiet. What, then, keeps up the circulation during this complete rest of the heart? It is the tension in the elastic vessels. I think you are all acquainted with an ordinary spray apparatus and you know that while your hand is quiet, between the intervals of compression, the pressure of the air

in the apparatus remains almost constant and that this constant pressure is due to the fact that the tension in the elastic bulb keeps off the pressure in the spray apparatus while your hand is at rest. You can readily see that the tension inside the elastic bulb can be altered in two ways, either from what I may term the ball end or the cardiac end or from the spray end or peripheral end. If you work the ball quicker you get greater tension in the bulb. If the heart acts more quickly as it does in an animal after a section of the vagi, it is found that the tension in the arteries of the animal rises very considerably. If you contract the peripheral end and allow the air to pass out very slowly from the bulb you raise the tension, and if you contract the peripheral vessels of an animal you raise the tension in the arterial system. Now, it is necessary for the wants of the body that we should have a constant circulation, but we require also to have the circulation increased in parts according to the functional activity of those parts, and so we find that when an organ is in active work the circulation throughout becomes quicker, and the excess of blood which goes to the organ in functional activity is supplied, to a great extent, by the vessels in other partsof the body; so that, although blood is pouring more quickly through the vessels of one part, it is passing more quickly through the vessels of another. As Professor Ludwig used to say:- "The vaso-motor nerves are like the turncock in a large town. They turn off the blood from one part of the body while they are turning it on to another". But if you have two or three organs all working together you want a large supply of blood to them and, in order to have this, the heart must act more quickly, and so we find that when the tension within the arterial system falls, the heart begins to act more quickly and the tension is again brought up to the normal. On the other hand, if the tension grows too high there will be a risk either of the heart being unable to overcome

the pressure in the vessels or else that one of the vessels might give way in some part of the body, especially in the brain, where, as a rule, the consequence of such a rupture would be disastrous. But when the tension rises too high in the vessels from the various nerves, more especially one known as the depressor nerve, which is stimulated by the tension either in the heart or in the aorta, it acts upon the vaso-motor centre in such a way as to cause dilatation of the vessels in the abdomen and then to lower blood pressure and in this way we have the pressure kept very fairly normal. You see, Ladies and Gentlemen, how very important it is that we should be able to measure the blood pressure. When the pressure falls much below the normal we require to use means to bring it up, namely, cardiac stimulants or vaso contractors or both together. When the pressure rises, however, it is even more dangerous because we then run the double risk to which I have already referred. As people grow older not only do the vessels become more brittle but the pressure tends to rise from changes in the peripheral vessels, so that we find with advancing years the pressure rises steadily and very often constantly until it attains such a high point that either the heart fails or the vessels in the brain give way. I believe that if we recognise this danger in time, we are able by the use of vascular dilators and by appropriate food to lessen the risks and add ten, perhaps more, years to a man's life. It is, however, clear that the exact measurement of the arterial tension is a very important matter and it is ordinarily recognised that the tension of the pulse is as important perhaps as its rapidity. The usual way of taking the tension of the pulse is to put one finger upon the radial artery close to the hand and another finger just above it, to press with the second finger until the pulse can no longer be felt by the person and to estimate from the amount of power employed, the pressure that has been exerted in order to stop the pulse at the wrist. In this way we are able to

distinguish quite easily a soft pulse or a hard pulse or an extremely slow pulse, but we cannot tell exactly how soft or how hard it is. We cannot express the hardness or softness in numbers. The first idea would then naturally be to employ, instead of pressing with the finger, some little instrument that could give a definite record of the amount of pressure we are exerting.

I show you one which is very much like the ordinary letter balance with the top taken off, so that in place of the plate upon which the letter usually rests you have simply a small pad which you place upon the artery. You then put one finger upon the wrist, just above it you put the pad and you press the pad until you no longer feel the pulse. Even the simplest form of this instrument requires observation while you are pressing, because the moment you relax it springs back. I show you one in which the springing back is prevented by a little catch and in the same way as you take up a registering thermometer you can read off at your leisure the number of grammes that you have employed in pressing the pulse. You will observe in this instrument that the scale is small and it is, therefore, difficult to read off with any great amount of exactitude the pressure which has been employed. To overcome this difficulty another instrument has been devised where, instead of simply the elongated scale, there is a dial upon which the movements of the index are magnified. There is also a little indicator which remains at the maximum point, so that you can read it quite comfortably. This instrument is applied in exactly the same way as the one I first described. When you desire to set it again you just turn the pointer back to the zero point. In both of the instruments just described you will observe that the pad which covers the vessels is very small. It is rather difficult to apply it in such a way as to be quite sure of getting correct readings, and, as a matter of fact, it is apt to give erroneous readings. In order

to get over that difficulty fluid pads have been employed. One of the simplest is a very elongated funnel upon which a scale has been engraved. This is filled with mercury and is put upon the pulse in the same way and used precisely like the other instrument. The difficulty, however, is that it is almost impossible to cover the end of the funnel in such a way as to prevent the mercury from coming out. To obviate this trouble my old friend, von Basch made an instrument. He had a bulb blown at the end of a piece of tube in such a way that the bulb partially enveloped the end. This bulb was filled with mercury, which was applied indirectly by putting the whole bulb and tube into a jar filled with water, one end being firmly covered with a cork or metal cover and the other end being covered with a piece of india rubber. This was placed upon the artery in the same manner as the funnel and it gave very good readings, but unless the bulb and tube were kept perfectly perpendicular the mercury got out, the water got in and one could no longer obtain any satisfactory reading. I am sorry to say that, as I have not used the instrument for a long time, the bulb and holder have got out of order and I can only show you the standard. The bulb and holder had to be placed in the stand, the wrist was then put into the stand and held fast by a clamp. The mercury in the bulb was then lowered upon it until it compressed the pulse and at the very end was placed a small pad communicating with one of Marey's tambours which shewed the oscillation of the pulse when the beat was present and which ceased to move when the pulse stopped.

The difficulty that von Basch had with this instrument, which is only adapted for work in a laboratory, induced him to make another, which is really a very useful one. In this he had a small bulb of rubber filled with water and this communicated with an aneroid, so that when the bulb was pressed upon the artery the aneroid rose and the pressure was continued until the

pulse stopped. The reading was then given off directly upon the scale of the aneroid. You will be able to understand the nature of this first apparatus of von Basch by comparing it with the illustration which I gave.

Von Basch really was the first to introduce the method of measuring the blood pressure in man, and I take this opportunity of bringing this fact before you because I think poor von Basch's claims were not recognised to the extent that he deserved. He died only a few months ago and I think it is only fair to his memory that we should bring into prominence the part that he played in initiating the measurement of blood pressure in man. Another apparatus, which also depends upon the application of a fluid bulb to the pulse is a very neat little one invented by Mr. Leonard Hill. He has avoided the difficulty of using mercury by employing a colored liquid, which, having no weight in itself, gets the necessary resistance by working against a column of air. It consists of a glass tube with a piece of india-rubber at the lower end and this end of the tube is filled with a red liquid. If the tap at the upper end were open, there would be no resistance whatever and one could not get any measure of the amount of pressure, but by squeezing the tap at the upper end the air is compressed at the least pressure upon the india-rubber and by having a scale graduated according to the pressure, one is able to read off the amount of pressure necessary. Now it is quite obvious to you that the pressure employed to stop the pulse altogether must correspond to the maximum pressure in the vessel at any moment and therefore it corresponds to the pressure during the systole. Various opinions have been put forward in regard to the diastolic pressure and the mean pressure, and it has been stated by Mosso that the mean pressure is the pressure at which the greatest oscillation of a column of mercury or of water employed to measure the pressure takes place. Because, he said, when you

get the pressure outside the vessel and the pressure inside the vessel equal, you will then have the largest oscillation. This corresponds to the lowest possible pressure. I do not propose to enter into a discussion of this subject. The practical point is that you can try both methods, but it seems to me that in many cases it is the maximum pressure that is the important one because it is this that is going to tell in a case either of failing heart or of breaking artery. A very good instrument was made by Professor Oliver. It consists of a fluid pad, which works not against a mercurial column but against a

which also has a dial and the reading is very greatly magnified, so that you can read off to within very narrow limits. This is placed upon the artery and gradually pressed won until you get either the stop pressure or the greatest oscillation. Generally I have found that these two things bear the relation to one another of 5 to 4; that if you add one fourth part to the greatest oscillation, you then generally obtained the pressure that was necessary to completely stop the artery. A further instrument which I show you is almost exactly the same as that invented by vonBasch with this difference that instead of the bulb being partly of metal and partly of rubber, it is composed wholly of rubber, some of which is thick and some thin. There is in this bulb a piece of thickish, hardish rubber of a red color on the outside, and a piece of thin elastic rubber on the inside. This elastic rubber is placed upon the artery and the compressing finger is placed on the hard thick rubber outside. You then press the artery until you cease to feel the beat and read off the pressure necessary to do this on the dial. This apparatus is a very useful one because it is easy to carry about. You can employ it with great rapidity and it does not alarm the patient. With this instrument you can take the blood pressure in a man just as quickly

as you can feel the pulse. If you have one of these in your pocket you can take half a minute to count the pulse and the other halfminute will give you the blood pressure. Usually when I am not using the instrument, I leave one of the side-way stopcocks open so that the inside of the aneroid may communicate with the air and there may be no unnecessary pressure exerted upon it. The stopcock also allows one to use another instrument for confirming the blood pressure which is known as Potain's, but I think it is rather unfair to call it Potain"s, because it is really von Basch's.

Now, these instruments you will notice all depend upon the compression of a single artery, but there are other means of estimating the blood pressure by compressing a limb or part of a limb. One of these is Mosso's. This consists practically, one may say, of a metal glove in which there is an interior glove made of rubber. You put your finger in and then you can raise the pressure by a screw until the oscillation in the mercurial column stops and then you read off the amount of pressure required to stop the pulsation with the fingers. This is a heavy instrument and can only be used in the laboratory where it gives good results. A much lighter instrument is Gaertner's tonometer. This is simply a tube. You have round the finger a metal ring lined with rubber. You then press all the blood out of the end of the finger and by blowing up the india-rubber within the tube you compress it. You then allow the air very gradually to escape until you see the blood coming back to the finger nail, and then you read off the amount of pressure in the manometer with which this is connected. I show you a manometer and also a metal tube with the rubber lining internally. This is simply pushed on over the finger and then the interior is blown up, the blood being first of all expressed from the finger. The way of expressing it is this. You put over the end of the finger a small rubber ring somewhat like that which one uses to hold an umbrella. You raise

the pressure until it is up to about 140 and then take off the little ring and allow the pressure gradually to fall until you see the first indication of the blood returning. You will observe that instead of using this mercurial manometer, you can perfectly well use Potain's in exactly the same way. The chief disadvantage of this procedure is that it takes a good deal of time and for that reason it is less applicable for clinical work.

The next way of estimating blood pressure is, instead of using the finger, to use the arm and this is one of the most satisfactory means. A band is placed round the arm and we proceed in exactly the same way as we did with the tonometer except that we do not remove the blood from the arm. This method of estimating blood pressure is generally known as . It consists of a mercurial manometer with a scale attached. To one side of this manometer is attached a small bulb such as used upon a spray producer. To the other side is attached an elongated band consisting of soft rubber. On the other side the rubber is hard. This is placed over the arm and then drawn tight and tied and the amount of pressure requisite to stop the pulse is then read off on the mercurial manometer. It has, however, been found that by using such a narrow band as this the figures obtained for the pressure were too high and so another has been introduced by Leonard Hill and Barnard. In place of the mercurial manometer there is a large aneroid and in place of the narrow band there is a large band which is rendered rigid with leather. Instead of having a soft bulb and rubber such as one uses for a spray apparatus, it was found by Martin that R instrument could be greatly improved by having the band very much broader and rigid outside by using soft metal. This is a very good band indeed except that for carrying about it is somewhat heavy. I thought

it was unnecessary to have such a heavy band, so I had one made of lighter material which acts very well. Mummery has, I think, made another band which, in my opinion, is the best. In this the leather outside is rigid and resistant and inside the india-rubber part is covered by chamois leather and prevented from bulging over the chest, which is a very great advantage. Then the mode of fastening the band is very neat, catches being used in place of buttons. Sometimes it is necessary to take the capillary pressure, which can be done by means of one of the instruments, which I have described. For accuracy I myself depend more on the R

The best instrument for taking pulse pressure and the most convenient on the whole, I think, is Potain's.

Gentlemen,

The tension of the pulse has long been recognised as one of the most important indications to be derived from it, an indication almost, if not quite as important, as its rate. Nor is this to be wondered at for it is upon the tension in the arterial system that the circulation in the body depends. For thirteen hours out of the twenty four the heart is lying perfectly quiet, it is cut off completely from any connection with the arterial system by the closed sigmoid valves, so that during all this time the circulation of blood through the tissues is kept up by the tension within the arteries. This tension depends upon the amount of blood pumped in from the cardiac end in a given time minus the amount which passes out through the arterioles into the veins in the same time. It can thus be raised by the heart pumping in more blood or by the arterioles contracting and lessening the outflow, and it can be lowered by the heart pumping in less blood, or by the arterioles dilating and allowing more blood to run through them. There is a natural provision in the body for allowing more blood to pass to an organ when it is in a state of functional activity because the vessels in the part then dilate and allow the blood free access to it. But if this were to happen in all parts of the body at once the tension would fall so low that the circulation might cease, and more especially the brain which requires a large amount of blood might be starved for

the time being and syncope might ensue. To prevent this, as a rule, it happens when the vessels of one part become dilated that of the others becomes contracted so that all the blood pressure becomes more or less constant. But this arrangement would not meet all the needs of the organism and there are further means which exist for ~~eqxkx~~ equalising the pressure. Whenever many peripheral vessels dilate so that the blood pressure falls in the arteries, the mere fall seems to act as a stimulus to the heart. It bats more quickly, sends more blood in and thus the pressure is kept nearly to the normal. On the other hand if the vessels contract much so that the pressure in the arteries tends to rise too high, the increased pressure stimulates the vessels in the medulla oblongata and thereby slows the action of the heart. The slow action causes less blood to be pumped into the arteries and the pressure is again kept nearly right and prevented from rising too high. In certain conditions of debility we find the pressure tends to become low either from dilatation of the peripheral vessels or from weakness of the heart itself. In others on the contrary the pressure tends to rise too high because the vessels offer too great a resistance to the passage of blood through them, the resistance produces cardiac hypertrophy and the tension which is then raised from both ends of the arterial system rises so high, as in the end, to prevent the heart from eptying itself and thus bringing on a pain similar to that of other hollow

organs which cannot empty themselves, or else causes rupture of the vessel, more especially in the brain, giving rise to paralysis or death.

A knowledge of the arterial tension is thus of the utmost importance in practice. It does not matter so much measuring the tension when it is low as other symptoms such as general feebleness which it produces obliges the patient to take rest. But high tension is different. For a high tension often means a free supply of blood to various organs, and especially to the brain giving rise to energy and power which is pleasant to its possessor and often a source of admiration and envy to his friends and acquaintances, and yet this excessive energy may frequently be looked upon as a precursor of danger. In the old days when the steam boats in the Mississippi were in the habit of racing it was by no means an uncommon practice for the captain to sit down upon the safety valve. The increased pressure of steam which this produced in the boiler made the steamer forge ahead. It was for the time being a better boat and out-distanced its competitor but the high pressure was frequently too much for the boiler which exploded and completely destroyed the boat and most of the passengers. In elderly people high tension at the pulse is a sign that requires to be watched with the greatest care and whenever it rises above the danger point, measures should be taken to reduce it, even if this should lessen the patient's apparent power and make him

feel comparatively slack. The ordinary plan of estimating the tension of the pulse consists simply in placing one finger upon an artery, usually the radial, so as to feel the pulse, then pressing with a second finger between the first one and the heart, and estimate the amount of pressure by the exertion employed which is requisite to compress the pulse so that it can no longer be felt by the finger on the distal side. Most instruments for estimating the arterial tension are simply pressure gauges which are employed to take the place of the compressing finger in the observation I have just described. The simplest of all is the spring balance, such as is often used for weighing letters, but in place of the flat plate upon which the letter is laid there is simply a little pad to compress the pulse. One inconvenience which an instrument like this possesses is that as a rule you have to double your head down to see where the index is when the pulse has been stopped and this is a decidedly awkward position. To obviate this the next improvement consists in a spring catch which holds the index in position so that it can be taken away and read with comfort. (example shown)

But in a simple spring balance like this the scale is short and so the pressure often cannot be read with sufficient exactitude. The next improvement consists in arranging a dial with a movable hand which magnifies the movements of the

spring and to which the maximum index can also be attached for the convenience of reading.

Bradycardia.

Clirical Lecture. Delivered at St. Bartholomew's Hospital. Friday November 11th. 1898. by T. Lauder Brunton. M.D., F.R.S.

Gentlemen:- We have at present in the wards a rather remarkable case of extreme slowness of the pulse and I have thought it advisable to take this as a text for some remarks I have to make to-day. In order to describe functional ~~Before~~ understand~~ing~~ ~~throughly the~~ diseases of the heart, it may be advisable to begin with a short summary ~~is absolutely necessary to have some idea~~ account of the nervous mechanism of the heart an~~d as perhaps your knowledge of physiology may not be always so fresh as it was when you first left the physiological class room, I will run shortly over some of the points about the nervous supply of the heart.~~ Harvey showed long ago that if the heart were cut in pieces the pieces would continue to beat. Kell Gas~~pard~~ and Bowditch have shown that pieces of a frog's heart which are apparently quite free from nerves or from ganglia will continue to beat. It is thus evident that the cause of rhythmical pulsation of the heart is in the muscular fibre, but although the muscular fibre is able to contract rhythmically by itself, yet the coordination of the different parts of the heart in itself are regulated, in all probability, by the

nerves and which
ganglia the heart contains. Thus we find that when the heart is excised from the body it will continue to beat, the different cavities contracting in rhythmically definite order until the heart is beginning to die when we will very likely find that this co-ordination between the different parts is abolished and the auricles and ventricles may beat more or less independently. But it is not sufficient that the different parts of the heart should beat co-ordinately with one another. The pulsations of the heart must be regulated in strength and in number according to the needs of the other parts of the body. I have elsewhere compared the heart to a dray- horse which will go along by itself but its pace is regulated by the driver who restrains its movements by the reins or hurries them up by the whip, according as it is necessary.

In the heart the vagus takes the place of the reins, slowing the heart down, and the acclerator fibres, which chiefly run in the sympathetic, act as the whip. The nerve which usually bears the name of "vagus" consists, ~~as you know, of~~ of both afferent and efferent various fibres the ~~former~~ afferent conveying impressions from the heart lungs and abdominal organs to the nerve centres and the efferent conveying impulses from the nerve centre to the thoracic & abdominal viscera. ~~parts. Pure~~ and simple, ~~it is a sensory nerve and the part~~ ~~of it which regulates the movements of the heart is really~~ ~~a branch of the spinal accessory.~~ Those fibres which supply the ~~other~~ stomach & intestines have motor functions but those which supply the heart ~~slow~~ are inhibitory and slow or weaken its action or both. The sympathetic fibres pass out from the neck and pass into the sympathetic

cord from whence they reach the cardiac plexus and when stimulated they make the heart beat much more quickly than before. We have then in the heart iself the vagus consisting, as you must remember, of roots of fibres and of ends in the heart and the sympathetic system. Now, we know how far the vagus is able to regulate the beats of the heart in man, because when atropine is given to an animal or a man is poisoned by the same drug, we find that the inhibitory fibres of the vagus are completely paralysed, so that no irritation applied to the vagus of the stomach is able to slow the heart any more. When a man is poisoned by atropine we find that his pulse generally goes at the rate of 120; so that we may take this as being the usual rate of a heart completely deprived of any inhibitory restraint on the part of the vagus. Any excess over 120 we may attribute to something else, either stimulation of the heart itself or stimulation of the accelerator fibres. Now, one of the most powerful stimulants to the heart is warmth. When the excised heart of a frog is heated up the movements of the heart become quicker and quicker until at last they stop entirely in systole. If the heart be cooled down quickly you find that the reverse process occurs;

the systole gives way to rapid beats and these become slower and slower until at last it stops still in diastole. If the heart be heated rather too much this heat ~~tension~~ Tetanus passes into heat rigor, when the heart is incapable of being restored to its normal condition by cooling again.

Now, in various pathological conditions we meet with alterations in the rate of the heart and the most common of all is the acceleration of the pulse which occurs in cases of fever. In most cases of fever the acceleration is to be looked upon as the natural result of the high temperature, and just as when a man is hurried for a while in walking there comes a reaction and he walks more slowly; so in cases of fever we generally find that after the heart has been beating for some weeks at a quicker rate than usual when the temperature is high, it begins to beat more slowly than usual when the temperature falls to the normal or below it as is usual in convalescence. We find, however, that the heart may beat more slowly not only in reaction after acceleration in fever but from various other conditions, and more especially from those which either raise the blood pressure and thus cause increased tension and consequent irritation in the

vagus roots; or in cases where we get reflex stimulation of the vagus from some organ. You know that when the pressure is raised in the medulla by placing an animal or a man in a horizontal position the pulse at once begins to get slower, but if you lessen the pressure by putting the animal or the man in the upright position the pressure in the medulla gets less and thus diminishes the tension in the vagus roots, so that the vagus has less influence upon the heart and the pulse begins to go more quickly than before. But the vagus roots can be stimulated, not only by increased pressure in the medulla but reflexly. For example, if a patient or an animal takes a strong inhallation of the vapour of ammonia or any other powerful volatile irritating substance, the pulse tends to become slower and the heart may even be completely arrested. We may get reflex stimulation of the vagus from other organs as, for example, from the stomach, irritation in which may cause great slowing of the pulse because the irritation of the gastric branches of the vagus being transmitted upwards to the medulla oblongata is reflected down the inhibitory fibres and slows the heart. When the irritation of the stomach is removed the heart goes on again at the normal pace. Similarly, you may get irritation of the vagus reflexly from other

abdominal organs, such as the liver, the intestines, the kidneys and probably also from the uterus and even the bladder.

Stimulation of the vagus may occur also from irritation of the skin and, as I have just mentioned, stimulation of the first part of the respiratory passages has a powerful effect in slowing the heart. Usually the heart is sufficiently strong to overcome any ordinary difficulties, but now and again it is not strong enough to do this and we find that it alters its place according to the resistance opposed to it or to the demand made upon it by the lung in different phases of respiration and thus you may get the pulse altering during inspiration and expiration in what has been called a paradoxical fashion; the pulse during inspiration being small and rapid and then during expiration slower and fuller.

The extreme slowness of the pulse has been produced experimentally. More especially do we owe our knowledge of this subject to Czermak, the late Professor in Leipsic, who had a small exostosis on one of his cervical vertebrae and by pressing his thumb upon the vagus on the right side he was able to just catch the nerve between his thumb and the exostosis) was able to stimulate his right vagus to such an extent

that he could either slow or stop his heart entirely at will. The same effect can be produced by most people if they care to press with sufficient force upon their right vagus, and I may mention here that the right vagus is generally more powerful in slowing the heart than the left. Indeed, in some animals the left vagus has no power whatever. This was first shown by Bernard Moore in a small lizzard where he found that the left vagus had no action upon the heart, and in many experiments that I made myself, but did not publish, I found that in the rabbit the power of the right to slow the heart is generally very much greater than that of the left, although in very few cases do you find that the left vagus has not any power at all. In most cases both vagi have the power of slowing the heart, but it is very much greater in the right than in the left. This however varies in different animals; I mean different of the same species, and in all probability it will vary also very much in man. So that if you find in your experiments that you are unable to stop the heart by pressing upon the right it may be worth while to try pressing upon the left vagus. This experiment however

is one that cannot be carried out to any great extent because, as Czermak found, pressure on the vagus causes an indescribable feeling of oppression on the chest. The name he gave to it was "beklemmung". The feeling is that of the hand of a giant who has caught your chest and is squeezing it together, and on account of this unendurable oppression most men are obliged to press upon the vagus only for a very short time indeed. The same effect may be produced by toxins of various sorts or poisons. We find that nicotine and digitalis and all the numerous members of the group of so-called cardiac poisons have a tendency to slow the heart, their action being exerted partly upon the vagus roots and partly upon the vagus ends in the heart itself. We may find also that slowing of the pulse beyond the normal rate comes on from pressure within in the brain as, for example, in cases where there is oedema, in cases meningitis, although very often we find there that not only is the pulse slow but it is irregular, and in some cases of cerebral tumour. The rapidity of the pulse rate however in such cases depends very much upon the part of the brain which is affected, because although, as I have mentioned, the vagus roots are

sensitive to pressure and when the pressure is increased upon them you tend to get slowing of the pulse, yet in other parts of the brain there are quickening centres and irritation of them will make the heart go very much more quickly than before, and when the irritation is removed the heart will return to its normal rhythm.

I do not think any of you can possibly remember a very interesting case which occurred in this hospital of a blacksmith who when engaged in his work was struck by a piece of iron upon the right frontal region. He was brought to hospital and his pulse was going at a tremendous rate. One day when the pulse was found to be in this condition and when he was completely comatose he was trephined. A large quantity of pus was let out from an abscess which had formed under the bone and immediately on the relief of the tension the pulse returned to its normal rate. Now, something of the same sort occurs if you overdo the experiment that I mentioned to you a little while ago. If instead of lying down flat upon your back and finding that you pulse is slow, you allow your head to droop over the end of a sofa and until it is nearly reaching the ground, you will very likely find that your pulse is very much quicker than normal instead

of being slower; the tension in some other part of the brain apparently having more than counter-balanced the increased tension in the vagus roots, and so instead of slowing we get very marked quickening.

In the present case it is exceedingly difficult to come to an exact diagnosis in regard to the slowness of the pulse. The patient, whose name is Taplin, is a dispenser. He was admitted on October 31st complaining of shortness of breath and slowness of the pulse along with a tendency to fainting which has come on at intervals and has prevented him from following his profession. It came on also very markedly in the carriage which brought him to the hospital, so that he was obliged to stop and get out and go to a chemist, who gave him some sal volatile, which picked him up and enabled him to resume his journey. His age is 29. He was perfectly well until 18 months ago, when he began to suffer from shortness of breath on exertion and fainting fits. He had as many as seven in an hour at one time, his pulse was very slow, and the attack lasted for three months. In May of this year he had a second attack which has lasted up to the present time. It was worse about June, but after taking more care of himself and lying up a good deal, he became better and had no fainting fit until that which occurred in the carriage. During the fits

of fainting, which lasted for about one minute, he does not struggle. After the fit is over he feels ill , but has no headache nor any pains such as are common in cases of epilepsy. One point that strikes one on looking at the patient is that the face appears so much flushed and suffused and that it is of a dusky character. yet, at the same time, the large veins are not swollen. you do not see the jugular standing out as you generally do when there is much compression upon the venous trunks, so that I must tell you at once that I do not quite know what is the cause of the slowness of the pulse or of the suffusion of the face in this man's case. I thought at first it might be some pressure upon the vagus, but I can find no evidence of it. I can find nothing definite in the heart itself, nor yet any evidence of cerebral lesion. Now, when one fails to find any definite organic lesion, the next thing that occurs to you is that there may be some chemical lesion - some poisoning. We have not been able to find here any definite poison, although the symptoms are those which I know we could produce by continuous overdoses of digitalis carefully maintained. So as we cannot find any poison that we know, we are inclined to look for some that we do not know, and it is quite possible that this may be so. That he has generated

in his body some form of poison which is leading to the exceeding slowness of the pulse. In order to try and counteract this, we are just now giving a substance which has just the opposite effect, namely, to render the pulse exceedingly rapid and that is thyroid tabloids. In cases of myxoedema treated with thyroid tabloids, we find that the pulse, previously slow, becomes, quite quick, and that we produce a condition of the heart and a relaxation of the vessels similar to what occurs in exophthalmic goître. Now, in exophthalmic goître we find just the opposite condition from that which we have in our patient. Here we have a ~~xxxx~~ marked case of so-called bradycardia, in exophthalmic goître we get the exceedingly rapid pulse known as tachycardia. In the patient whose case we are discussing, the bradycardia seems to last more or less permanently. He has intervals of freedom from fainting, but the pulse seems to remain more or less permanently slow. In exophthalmic goître, we have a somewhat similar condition, namely, that the pulse there is more or less permanently fast although it may be accelerated even beyond the ordinary limits by emotion and by exertion, and sometimes it may be slower than usual from the patient being kept absolutely quiet. In other cases of bradycardia we find that the slowness of the heart

instead of being permanent, as in this one, is paroxysmal. For example, you go to a patient one day and his heart is very much slower than usual. These cases are generally due either to some reflex condition or some toxic condition or the two combined; in fact, I rather fancy that in most cases they are due to a combination of the two, and they not infrequently come on in patients who have eaten something that has disagreed with them, something that apparently has caused irritation of the stomach. But we know perfectly well that many patients who take substances that disagree with their stomach and may make them sick, yet they do not get this extreme condition of bradycardia, and, therefore, in those cases it is probable that some toxin plays a part as well. Now, toxins play a part also in the production of tachycardia. I have just mentioned that the active substance of the thyroid has the power of quickening the heart very considerably, and that it renders the vessels more dilated and the skin moist.

There are certain other conditions in which you may find the heart very quick instead of being very slow. I have mentioned to you that after fevers you as a rule tend to get the heart slower than usual, as a sort of reaction from the quick beat that it had during the period of raised temperature. But

sometimes instead of this you may find that the heart is beating very quickly. One of the most marked cases of this that I have ever seen was in a case of diphtheria, where the boy had completely recovered from the symptoms of the disease, but where his heart was beating with extraordinary rapidity. In that same boy one found on trying the knee-jerk that it was gone, and from what we know of diphtheria we are certain that degeneration of his peripheral nerves had taken place, produced by the toxins of diphtheria, and there could be little doubt I think in this boy's case that degeneration of the inhibitory fibres of the vagus had occurred, and that was the cause of the extreme rapidity of his pulse.

There is another disease in which we find, or rather I should say a morbid condition, degeneration of the peripheral nerves, namely, in alcoholic neuritis. In this we sometimes find that the patient's pulse is going very rapidly, much more rapidly than before, and you find also that in some of those cases at least the drugs that you give to slow it have no action whatever. This was first impressed upon me many years ago by seeing a man of great ability, who had a curious business. He used to grind men up by correspondence. He sent out questions to them, they returned answers which he corrected and he got men through examinations in all

parts of the country. The work was of a very worrying nature and he used to get very much fagged, as one might naturally expect, and he was accustomed to sit with a tumbler of whisky and water by his side and was constantly sipping. He never got drunk, nor, indeed, befogged, and conducted his business perfectly well, but the constant sipping brought on alcoholic neuritis and amongst other things it appeared to bring on neuritis destroying the power of the inhibitory fibres of the vagus. We tried him with digitalis and other drugs, but nothing seemed to have any effect; the heart by and by became dilated and the poor man died of secondary mitral incompetence with all its essential difficulties and pains.

CEREBELLAR TUMOUR.

Clinical Lecture delivered by Sir T.Lauder Brunton M.D.,F.R.S., at St. Bartholomew's Hospital on Friday July 13th., 1900.

Gentlemen:- The case to which I wish to direct your attention is one of considerable interest. It is that of William Wiseman, a warehouseman, aged 25, who was admitted on May 13th. I will first of all ask you to look at him and then we will discuss the case. You will see that there is no expression of pain upon the face and you notice that the head is bandaged up in consequence of the operation. I would like you to see him walk. You will observe that in walking there arenone of the movements that are observed in cases of locomotor ataxia, nor is there the movement of the feet clinging to the floor that is observed in spastic paraplegia. As he was unable to walk by himself, you are unable to see the condition which existed when he came in the Hospital. He has been, upon the whole, a very healthy man. He had scarlatina and nephritis when he was eight years of age, but that seems to have passed off and left no trace behind. About a year ago, he fell upon the back of

his head , but this seems also to have left no immediate effects. About the middle of February last, five months ago, or about three months before admission, he began to complain of headache. This headache used to occur when he arose in the morning; it came on also during the day after any exertion and became worse after anything that jolted him; it ceased, however, when he lay quietly upon his back. This is the first symptom to which I wish to call your attention. The headache was persistent, severe, ingravescent, it generally came on at the back of the head, very nearly in the centre of theoccipital region, but rather more to the left than the right. This lasted for about two months and then to the headache was superadded another symptom, that of vomiting. This, like the headache, came on on getting up or even upon waking and came on also after exertion. Now, this headache I wish you to note was superseded by a feeling of sickness and when he actually vomited the headache was often relieved by it. These symptoms had gone on becoming worse and worse, until he was admitted on May 13th. On admission he was found generally to be a healthy man. The only thing we could find wrong was the

occurrence of a slight systolic murmur both at the apex and at the base but there was no other indication of cardiac disease. On testing his reflexes, they were found to be normal. A certain amount of nystagmus was observed in the eyes and the eyes tended to move rather to the right. When he was asked to walk his walking was somewhat uncertain when he started, but after he had gone about half the length of the ward he became much more steady upon his feet and could walk fairly well. However, one almost noticed that even when walking fairly steadily he bore a little to the right so that, for example, if he were walking towards the corner of the table on his left, he would incline a little to the right of it. On examination of his eyes, we noticed the third symptom, namely, optic neuritis. These three things indicate, as a rule, either abscess or intracranial new growth, but there were a considerable number of points to be noted as not being quite according to rule. The headache had certain of the characters that one would expect; it was very severe, localised, persistent, ingravescent. The headache was made worse by movement or by shaking. The vomiting, however, was not that which is usually characteristic of

intracranial disease. In intracranial disease you find that the vomiting frequently comes on, or indeed generally comes on, without almost any warning. It is unlike the vomiting of gastric disorder, where you find first of all a certain amount of nausea, gradually increasing until the patient vomits. In intracranial mischief, you generally find the vomiting coming on, frequently very severely and very abruptly, without any preceding nausea. In these points, therefore, the vomiting in this patient did not correspond with what we usually find in intracranial disease. The optic neuritis was also different. When I first looked at his eyes, there was but little swelling in the vessels, and the papilla was apparently swollen only at its apparent outer edge. The diagram shews the appearance presented by it. The internal edge of the disc was quite distinct. There was so much uncertainty about it that I desired Mr. Bernard to examine the patient and he found that the vessels had become more congested than when I looked at them, and later on, before the operation to which the patient was subjected, the whole of the disc had got blurred and was very much reddened. There was very marked optic neuritis indeed.

You will observe that here we had, not in the most characteristic form, the symptoms of intracranial disease, and so one was at first a little uncertain as to what the nature of the man's malady might be. It might possibly have been functional, but still the symptoms pointed, not characteristically, to intracranial mischief. There was no very definite localising lesion. The only thing we could find was this tendency to fall slightly to the right. First of all, on the supposition that it might be simply functional, we put him upon salicylate of soda and bromide of potassium, because these drugs very often relieve functional headache, but the treatment proved useless. We then tried iodide of potassium with mercury on the supposition that it might be syphilis, but no improvement was observed. The only thing that did him any good was phenacetin, with caffein, and these medicines relieved the headache for a short time. But the condition of the patient was becoming so much worse, and all our medicines having failed to give anything more than a very imperfect and very temporary relief, I came to the conclusion that it would be best to

operate, but then, in the want of localising symptoms, what was to be done? There was no rotation of the body, but simply a tendency to bear to the right. In addition to that there was some nystagmus and as we had been unable to find any other indication of sclerosis, these two things together seemed to point to the cerebellum. Lesions of the cerebellum are difficult to locate. Supposing that one of the lateral lobes is much damaged, the tendency is for the patient to rotate. Supposing in this case that the intense headache, more to the left of the occiput, indicated lesion of the left lateral lobe of the cerebellum, what you would expect to find if that lesion were at all extensive would be that he would have rotated on his own axis; turned round towards the side of the lesion. But, if it were only a slight lesion, we would not expect to find this rotation. All that we would expect to find would be that he would tend to fall or bear to the right and this is what he actually did. In Ferrier's book on "The Functions of the Brain" second edition, page 186, he says:-

> "Hitzig found that when the lateral lobe was very extensively injured, the animals rolled over and over to the side of lesion, with as great force as in Majendie's experiment on the peduncle itself. But other experimenters have not always observed rotation

towards the side of lesion. Much appears to depend on the extent and situation of the lesion. If the lesion affects the whole of the lobe, the tendency is to roll over towards the affected side, i.e. to revolve on a vertical axis towards the sound side. If the lesion is less extensive, the disturbance of equilibrium may not be so severe as to cause rotation, and the animal may fall towards the opposite side."

The only thing here that I could find then was the tendency to roll to one side, and this along with the pain, apparently localised towards the left side, determined me to ask Mr. Walsham to expose the left lobe of the cerebellum and see whether we could find any mischief in it. The two things that one expected to find were abscess and new growth. Against the abscess was the absence of anything that was likely to start abscess, there being no disease of the ear, and, although one might expect abscess to come on after the fall that he had had, yet it would probably have come on in a shorter time than a year. I was inclined therefore, to think that probably the blow that he had the year before had started some new growth; because, we not unfrequently find that an intracranial growth begins to grow after some injury, and so I thought that in all probability the patient was suffering from a glioma affecting very likely the left lobe of the cerebellum. But if you read the experiments on cerebellar functions you will find that it is very difficult

to be quite certain as to what the results of the lesion would be. I was determined in fact, in the localisation, chiefly by the pain being so distinctly more to the left than to the right side. Mr. Walsham accordingly operated laying bare the left lobe of the cerebellum. We at once found that there was great intracranial pressure, because the brain immediately bulged forward out of the wound. This is a thing that we never see in a healthy brain and it shewed that there was great pressure within the cranium. This, of course, did not tell us anything in regard to differentiating between abscess and a growth, because the bulging may occur with both. It is I think, however, more likely to occur with a growth, and I expected that when a hollow needle was passed into the cerebellum, we would get no pus coming out but that we would possibly come upon something harder than the brain substance. I thought, indeed, that it was just possible we might get some fluid coming out, because in these gliomata, not unfrequently a cyst forms in the glioma and a serous fluid exudes when a needle is put in. We got no liquid out whatever, and the

needle did not seem to encounter anything but healthy cerebellar tissue. There was the possibility that I had been right about the cerebellum, but wrong about the lobe. The patient was, however, t oo much exhausted to allow of any further operation and so the wound was closed up and dressed. The patient was sick on the day of the operation and on the following day. Mr. Walsham let out some cerebro-spinal fluid from the meninges, but he did not get any fluid on puncture of the brain itself. A draining tube was inserted under the flap, the patient did very well and a few days afterwards he had no headache, did not vomit again and the pulse, which was 56 before the operation, became immediately after the operation 104, and 140 an hour after the operation. Two days afterwards the pulse had fallen again to between 70 and 90. You see than that there had been a good deal of pressure upon the medulla, causing the pulse rate to fall so much below normal. After the pressure was taken off, we got an excessive reaction from the previous stimulation. This again passed off and the pulse fell to the normal. A large collection of fluctuating matter formed

below the flap, but what the nature of this was, we do not know. It might have been blood or it might have been partly some cerebellum matter. It has been absorbed and there is almost nothing to be felt now. The patient as you have seen is now very much better. The two most distressing symptoms, the pain in the head and the vomiting have both ceased, and there does not seem much the matter with him, at present, except his weakness. One might perhaps be hopeful that he was on the way to recovery, but I confess I do not feel very hopeful. I remember a child whom I had under my care in the year 1877 or 1878, very shortly after cerebral surgery had been introduced. The child was completely comatose, and I thought had a tumour in the brain somewhere on the right side, because the left side was partially paralysed, but beyond the general idea that it had this I was unable to locate it. On having an incision made, and a part of the skull removed, the brain protruded far. A needle was introduced and a lot of fluid spurted out with such violence as to go nearly across the operating theatre. After this had been taken out, the brain fell back nearly to its normal

size, but never quite. We were never able to get the brain quite back into the skull. The coma, however, passed off, the child had no headache, did very well and appeared to be progressing satisfactorily in every way but one, namely that the brain never resumed the normal, and after a good many weeks the brain protruded still more. Then the child began to suffer from the old symptoms and died, and at post-mortem we found a large glioma, quite as big or rather bigger than one's closed fist, in the centre of which had been a large cyst. I very much fear that the patient I have just shewn you has still a tumour on the brain, and I think that probably it may be in the right lobe of the cerebellum, but it is no use operating just now. We will see how far he improves and then if the headache should return and vomiting recommence, I shall ask my colleague to operate upon the other side of the cerebellum and see whether we can remove from that anything in the shape of a tumour. Now, in this case, everything medically failed entirely, the patient's life was a burden to him and the pain was so excessive that he was counting the hours until the operation should be done.

If it has done nothing more for him, it has certainly given him very great relief for the time being; it has prolonged his life somewhat, it may do something more for him yet and if one can find a tumour and extirpate it, we may possibly prolong the man's life for some years. Surgery, therefore, has come to our aid in this case, when medicine failed, and it is rather interesting in this relationship to look back for some years, all the more so because, about a couple of weeks ago, I happened to mention an experiment I saw once done upon an animal in this Hospital and one of my hearers seemed to disprove very strongly of the action. It was quite natural because the tendency of all good people is to hate what they look upon as cruel, and unnecessary. But experiments upon animals although they may not be directly to the alleviation of human suffering, do so almost certainly in the end, and the experiment that I mentioned happened to be one of the links in the chain that has led to the relief of this man's symptoms. When I first came to London, experiments on animals were very few and far between them, hardly any were made, and the one I have referred to was one belonging to a series. I had just missed a few months before

seeing the first experiment on the localising of the functions of the brain. In the Spring of 1870 I was staying for about a fortnight in Berlin, and my friend Professor Schmiedeberg told me that he was going to take me to see some experiments made by Fritz and Hitzig, who had discovered that if electrodes be applied to the surface of the brain, limited but definite movements can be obtained in a dog's paw. Unfortunately, something arose and my friend did not take me, and so I missed seeing the experiments and only heard of them. After coming to London, Doctor Ferrier and I secured rooms together. We had only one consulting room, which was quite enough for us both, inasmuch as neither of us had any patients to see, but having no patients, we of course had more time on our hands for other things. In the Spring of 1873, I went for a holiday to the South, and he went for his holiday to stay with Sir James Crichton Browne in the West Riding Asylum, and when he came back he told me that he had been working upon monkeys and other animals and had obtained some very remarkable results with regard to localisation. During that Summer as we were staying together, I naturally often helped him with his experiments,

as he mentions in the first paper upon the localisation of function, and then we did a series of experiments upon the effects of irritation of the brain and upon blood pressure, which, however, we have never published in toto, and they were only mentioned in abstract in his book on the Functions of the Brain. These experiments led to nothing more at first than to localisation, but after a while Ferrier began to mention the possibility of extending the operation to man. This was ridiculed at first as a thing not likely to happen and many said that if it did happen, it would be a very wrong thing to do. However, he localised a tumour, he got Horsley to operate, the result justified the expectations and since that time cerebral surgery has been recognised as a definite part of surgery. We have not obtained the same results from cerebral surgery that we hoped for at first, because with a new method of procedure such as that, people's hopes are likely to outrun reason. It was supposed that by means of cerebral surgery we should not only be able to remove irritant portions of bone, which are leading to epilepsy, to remove tumours, to let out abscesses and so on, but also, by taking away part of

the skull in cases where the development of the brain was insufficient, we should allow a child's head to expand in cases of congenital idiocy, and that we should possibly by taking away those parts of the brain which tend to cause crime, tend to convert our criminals into good members of society. I am sorry to say that these more glowing anticipations have been disappointed, but still, at the same time, you see from the case that I have just shewn you, cerebral surgery may be of very considerable use in prolonging the patient's life and relieving his symptoms. We shall keep a look out upon this patient and probably I may have occasion to mention him to you again, but at present I have said all that I think is necessary in regard to his case.

Hypertrophic Cirrhosis

Clinical Lecture by Sir T. Lauder Brunton, F.R.S.,
Delivered on Friday, February 2nd,
1900.

Gentlemen:-

The subject which I have taken today for Lecture is one which I find is of great difficulty. It is of great difficulty to me because the mass of literature to get up is very large, and I find that on going thoroughly into the subject there is a good deal of work which somebody has still to do before we can perfectly understand the disease. In June last there was admitted to "Rahère" Ward, a man who struck one by his appearance. He was dark, so dark as to resemble a case of Addison's disease, but he had not the pearly white conjunctiva so characteristic of that disease, and he had not the weakness and general depression which you find in Addison's disease. When we came to examine him, we found that there was a large tumour in the abdomen and on closer examination this proved to be the liver. We had therefore, in this case, two very

marked symptoms; bronzing of the skin and great enlargement of the liver. I was at first inclined to think that we had got to do with some malignant disease which was interfering with the supra-renal capsules and thus giving rise to bronzing and at the same time infiltrating the liver and giving rise to the enlargement of that organ. This diagnosis seemed all the more likely because the liver was irregular on the surface. There were two well-marked abscesses to be found on it and these might very well have been malignant disease. The liver itself came down to the umbilicus and reached an inch and a half to the left of the nipple line. For a good while I thought that this was the most likely diagnosis, but he did not begin to get weaker in the way that I should have expected from a man suffering from malignant disease. The bile passages did not become affected, he got no jaundice and just when I was beginning to wonder whether it could be malignant disease or not, a paper appeared by Osler on cases of Hypertrophic Cirrhosis with Bronzing of the Skin. A connection between bronzing of the skin and disease of the liver, or at least a functional affection of the liver had already been noticed in France and a good many cases of diabetes had

been recorded in which bronzing of the skin was a prominent feature.

Now, when we try to work back from the symptoms to their causes we have before us a task of exceeding difficulty. In regard to the bronzing of the skin, this is generally due to the deposit of pigment either in the epidermis or in the cells just overlying the connective tissue in the skin. This pigment we notice in ordinary healthy persons sometimes as a diffused colour over the face and sometimes in those blotches which are known under the name of freckles. In persons with black hair we more generally get a diffused colouration of the skin, whereas in people with fair or red hair the pigment tends to distribute itself very frequently in the form of spots known as freckles. Now, even in Europeans you may get the skin in a tropical climate becoming darker than the natives' of that climate. For example, if you go up the Nile as far as Assouan into the borders of Nubia you will probably find that Englishmen who are there get a darker brown than the Nubians themselves, whose skin generally has a somewhat clear evenly diffused brown colour but of a considerably lighter tint than the face of the

Englishman assumes on exposure. Pathologically, we find pigmentation of the skin occurring in spots or in limited portions in many women during the menstrual period, and you can sometimes tell that this period is occurring by noticing the dark colour of the eyelids in a woman. During pregnancy also, the pigmentation which we notice occasionally during menstruation becomes still more marked. In disease we find it more especially in cases of Addison's disease, where, as you know, we get disease of the supra-renal capsules generally of a tubercular nature. Why the pigmentation should come in Addison's disease, we do not yet know. Another common condition in which pigmentation of the skin is to be observed is in chronic malaria. The skin gets dark in many people before an aguish attack. It becomes a dark brownish colour, as if you had taken a brush with a solution of sepia and just brushed the skin lightly over. In persons who suffer from chronic malaria, it looks as if you had done this a good many times and their skin may become almost as dark as you would find it if it were shown in a sepia drawing. I have been struck a good many times with the

fact that I have been able to spot a case of chronic malaria from the colour. Some years ago we had in "John" Ward a man who was suffering from phthisis. Cases of ague are not common in this country, but this patient had such a very marked dark sepia brown complexion that I asked him whether he had had ague, and he told me that he was one of a band of navvies who had been engaged in making a railway near Chatham where the ground was of a marshy nature and as it was turned up the men who were engaged upon the railway began to suffer a good deal from malaria. The Contractor, who was making this Railway, was at the same time engaged in making the great Canal leading past H   to Amsterdam so as to connect H   and Amsterdam with the sea. The Contractor sent over a number of doctors who had had a good deal of experience in the treatment of malaria in Holland and under the treatment of these men most of the navvies on the English Railway soon recovered. A few of them, and my patient amongst the number, were so bad that the doctors said that they could do nothing with them and sent them away . On another occasion I was walking through the Hospital at Lyon and I

saw a man who had the same colour of face. I asked my friend Professor Lepine if this man had suffered from malaria. He said he did not know but that the patient had been admitted for chronic nephritis. On asking the man, he said "Oh yes; I had malaria badly. I was a soldier out in Algiers and I suffered from the disease very much." At the beginning of this year I was in a Hospital for Phthisical Patients at Palermo. Of course, you may say that any number of patients there are likely to have had malaria, but one or two of them had very dark skins and on asking whether they had had malaria they acknowledged that they had. Of course, it might have been a coincidence, but still when you get so many cases as I have seen you are struck with the fact that malaria has got a great power to produce darkening of the skin. This is not an isolated observation of my own. You will find that many others have made the same observation, but I think that it is not so often recognised as it might be, and especially it may be of advantage to those of you who are working abroad to recognise this fact, that chronic malaria may often be diagnosed merely by the colour of the skin.

It is, of course, a risky thing to diagnose any disease from one symptom, but still this may lead you to make enquiries.

Now, in another disease where we have great destruction of blood, viz, pernicious anaemia, you do not get this peculiar colour, but you get there a peculiar whitish yellow colour. In chronic malaria, as we know, there is a very considerable destruction of blood corpuscles and there is destruction of blood corpuscles also in Addison's disease. In the case of pernicious anaemia we also find great destruction of blood corpuscles, but,as you notice, there are these great differences in the colour of the skin, and when we come to examine the difference between the blood in malaria and in pernicious anaemia we find there is a considerable difference there too. In pernicious anaemia the amount of haemoglobin in each individual corpuscle is above the normal. In chronic malaria it is below, and we find there not unfrequently, free pigment granules in the blood. The blood is looked upon as the great source of pigment and when haemoglobin is destroyed it yields two

kinds of pigment, one of which contains iron and the other does not. The one which contains iron is haematoidin which is identical with the bile colouring material, bilirubin, and to the other form of pigment the name of haemosiderins has been given . The haemosiderins are not all alike so that there are probably more forms than one and so they are called haemosiderins instead of haemosidera. These haemosiderins can generally be recognised by the fact that if you treat them with ferro-cyanide of potassium and with either nitro-hydrochloric acid or hydrochloric acid you get a blue colouration produced. Now, this destruction of blood is a thing that goes on normally and we find that in the liver pigment is formed, bilirubin, but the liver stores up the iron which is produced by the destruction of the red blood corpuscles. You may find a fair proportion of iron, sometimes you do, in the bile, but very often you may not get much iron in the bile but you get it in the liver. In some experiments that Professor Sheridan Delépine and I made upon the various changes in the liver cells during feeding and fasting, we found that at about 12 hours after a meal

there were large quantities of iron stored up in the liver cells, whereas before the meal there was very little iron indeed. So that it would appear that during digestion there was a breaking up of old blood corpuscles in the liver; that the new material that was passed to that organ during digestion yielded something that combined with the iron and the iron, which was formed by the destruction of blood corpuscles during the earlier periods of digestion, was in the later periods taken up again and passed into the circulation probably in the form of haemoglobin. Now, the liver is to be looked upon not only as the coal-bunker of the body, but as the cinder sifter. The coal-bunker serves to store up material which is to be afterwards used. The liver stores up our carbonaceous foods in the form of glycogen during digestion and gives them off again during fasting, but it also stores up most carefully those substances that are difficult for the organism to get and retains them in the body. I have just mentioned that the liver stores up the iron and prevents it from going to waste. It stores up also

potash or soda as the case may be. You know that animals living upon the land can generally get plenty of potash salts which are found in abundance in vegetables, but they cannot always get soda salts. So great has the desire for soda salts become occasionally that the buffaloes upon the prairies of America run hundreds of miles to get to what are known as the Salt Licks. Our livers and the livers of terrestrial animals generally store up soda salts with great care so that the soda salts can be used again and again , but the potash salts they allow to go. This is just the opposite of what occurs with marine animals. They can get lots of soda but not potash and so the livers of marine animals contain potash which is kept there with the greatest care so as to maintain the balance in the body.

Now this physiological process of destruction of blood corpuscles and regeneration with the separation of iron in the process may occur in the circulation generally, and we have in the Wards a patient in whom some breaking up of haemoglobin has occurred so that instead of getting haemoglobin in the urine, haemato-porphyrin has occurred. Haema-

to-porphyrin used to be known in the old days when I first studied physiological chemistry as free haematin and this belongs to the class that I have mentioned, viz., the iron of the pigment haematoidin and does not belong to the haemosiderins. In that case you see we have got the iron free pigment appearing in the urine and in all probability a corresponding amount of iron containing pigment will be stored away some where in the body.

When the destruction of blood corpuscles occurs it may do so locally or generally. We find it occurring locally when the blood becomes stagnant in any part of the body. and we notice occasionally a great deposit of pigment from long continued irritation. Any irritant tends to cause a congestion of the part and long-continued irritation of any kind leading to permanent congestion may lead also to permanent pigmentation. For example, you find that in people who are not clean in their habits and who suffer from parasites that the long continued irritation upon the surface of the body will lead to a permanent pigmentation, so that you get a darkening of the skin simply through dirt, not from

dirt, but through the irritation probably of parasites. You notice the same thing in many people after the continuous application of irritants such as mustard plasters or turpentine stoups or even from the rubbing on of some irritant liniment. You have all noticed the changes which pigment undergoes with the production of a blackish colour, then a green and yellow, then final absorption. When the haemoglobin is broken up in the blood, as I have said, you may get some of it becoming free or some of it may remain in the broken up blood corpuscles and either of those may undergo change by being absorbed into cells and there the haemoglobin may be broken up completely so as to yield some of the free iron pigment or some haemosiderins. This occurs most specially in the vessels and cells of the liver; it occurs also, however, in the cells of the spleen and in the bone marrow as well as in those of the lymphatic glands In all those we find after destruction of blood, a tendency to the accumulation of haemosiderin or iron granules and at the same time another pigment to which the name of haemofuscin has been given, and this appears in those parts of the body where the haemosiderin is not present.

I have been able only to discuss to a certain extent the formation of pigment. The next question that would arise would be the enlargement of the liver which may occur from several causes. It may occur simply from the deposit of fat on the liver and this fatty deposit may be noticed after a rich meal. You can perhaps observe this better in animals because the slight enlargement in a man is not so easily made out as you can make it out in two animals both the same size feeding one and keeping the other fasting, when by comparing the livers you can see the effect of the meal very definitely upon the organ. You find it also occurring simply from congestion, and this is observed very frequently in cases of malaria also. In this disease you may find that the liver will get very much enlarged; indeed, so much so as to extend to nearly double its normal limits, but in such cases after the free administration of purgatives, especially when combined with mercurials, it goes down to its normal size in a very short time. When chronic, however, the liver remains more or less enlarged and undergoes changes in its structure. It begins to get harder as well as larger than it was before and this hardness is due to a development

of connective tissue. We find the connective tissue in the liver may appear in different situations. It may in one case develop chiefly from the portal vein and in another it may appear to develop from the bile ducts. We find also that in relation to the different development of connective tissue in the liver that we have got cirrhosis, divided by some into monolobular and multilobular. In the case of the monolobular cirrhosis we generally find that the connective tissue is surrounded with one single lobule, whereas in the case of the multilobular we find it surrounded with a regular island of lobules. The multilobular has a greater tendency to contract than the monolobular and from the fact that not unfrequently in the monolobular we get a large infiltration of rounded cells there occurs in that kind hypertrophy instead of atrophy. The monolobular has much less tendency to produce any contraction of the vessels and thus it does not tend to cause dropsy (ascites) in the way that the multilobular does. In the case of the patient that we have been considering the liver was much enlarged but there was no ascites, whereas in other cases that we have had in the Wards the liver was greatly contracted, and there was much ascite.

It is however, very hard to draw the line precisely between those two peculiar conditions, because you will sometimes find that even with a large liver there will be ascites, whereas in others with a small liver you may find that the ascites is by no means well-marked. Of course, in the case of the small liver where ascites is not marked, the want of accumulation of fluid in the abdominal cavity is most likely due to the formation of a collateral circulation because when the liver is much contracted it is almost certainly then that the vessels must be pressed upon and if so, ascites must come as a consequence. In my next Lecture I shall discuss the connection between the pigmentation of the skin and the condition of the liver and also the condition of the urine which we find in some cases, viz., the development of glycosuria.

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THE ACTION OF DIGITALIS.

CLINICAL LECTURE delivered by Sir Lauder Brunton, at St. Bartholomew's Hospital, on Friday, June 8th, 1900.

Gentlemen: We have at present in the wards a considerable number of patients suffering from cardiac disease and in such cases one of the drugs that we generally employ is digitalis. It is therefore very important that you should have an exact knowledge of the mode of action of digitalis and of the ways of employing it.

The most marked actions of digitalis are that it slows the heart, that it strengthens the heart and that it increases the secretion of urine. Its slowing action upon the heart and its strengthening action upon the heart are both chiefly due to its effect upon the muscular fibres, but this is not entirely so in the case of mammals, although it is mostly so in the case of frogs.

In mammals we find that the slowing action depends partly on the effect of digitalis upon the vagus centre and that when the vagi are cut, when the heart is slowed by digitalis, the pulse again becomes rapid. In mammals, too, we sometimes find that the heart in digitalis poisoning stops in full diastole, although in frogs the action of this drug is to make the heart contract more and more firmly until it stops at last in full systole, not from paralysis but from excessive contraction, and it is then found that if the heart be dilated from pressure within, the pulsations will recommence. The stoppage is simply due to the fact that the heart cannot contract any more strongly and must needs be stopped. The action of digitalis upon the blood pressure is one of considerable importance, and it is one that is a good deal disputed. There is very little doubt indeed that the blood pressure is raised by digitalis, but many Continental Pharmacologists hold that this raising of the blood pressure is due entirely to the action of the blood upon the heart, and that its effect upon the blood vessels has little or nothing to do with the result. I am

quite certain that this view is a mistaken one, and I think it is a view that may be productive of considerable injury if held by men who are practising medicine. I have taken the opposite view very strongly, and, without entering into all the evidence that I have brought forward, I may simply adduce the experiments that Dr. Tunnicliffe and I have lately done in regard to it, and which depend upon this simple fact, that the flow of blood or the flow of any fluid through an opening is slower when you contract the opening, but that the flow through an opening of a given size depends to a considerable extent on the pressure behind. Supposing, for example, we take a reservoir and we have at the lower end an opening of a given size. The water will flow out of the tap more quickly when the reservoir is full than it will when the reservoir is nearly empty, provided the tap be always of the same size. If you find, however, that when the reservoir is full the fluid is flowing more slowly out of the tap than when the reservoir is nearly empty, you may conclude that somebody has been turning the tap; that the opening is smaller than it was before. Now, that is what we find

when we have given digitalis. It raises the blood pressure and at the same time slows the flow of blood from the arteries into the veins during the diastole of the heart. We will take a normal tracing with a blood pressure. We stimulate the vagus and at once there is a fall; stop the vagus irritation and then the pulse begins to get quicker and the rise of pressure begins. If you give digitalis you will get a tracing more like A . Irritate the vagus again and you get, instead of the pressure falling more rapidly, with the high pressure of the digitalis, during the diastole, a much slower fall. I cannot see any other explanation for that than that the digitalis contracts the vessels and therefore prevents the blood from flowing as rapidly from the arteries into the veins as it would otherwise do. Now, the practical point of this is that digitalis is most useful in cases of cardiac weakness; but supposing you get a particular case in which the muscular fibres of the heart are much degenerated, while the muscular fibres of the arteries are still perfectly healthy, and you give digitalis, you may raise the pressure within the vessels by contracting the arteries and

thus oppose a resistance which the weak heart is unable to overcome. In some cases of fatty heart it is found that the administration of digitalis does a great deal of harm. This is a point that is a good deal disputed, but I have seen cases which leave no doubt whatever of the fact in my own mind. The other feature in the physiological action of digitalis is that it causes increased secretion of urine. It does this to a great extent by raising the blood pressure. The higher the pressure of blood in the systemic circulation, other things being equal, the more rapidly will fluid run out from the glomeruli of the kidneys and the more urine will the patient pass per diem. But, just as in the case of the arterial system generally, so in the case of the kidneys, the digitalis may cause contraction of the renal vessels, and we find that on giving this drug to an animal the secretion of urine, instead of becoming greater, may at first become less, although the blood pressure is steadily rising, and after a certain time, while the blood pressure has gone up high above the normal, the secretion of urine may completely stop. Wait a little longer, the blood

pressure will begin again to fall, and then the secretion of urine may become abundant. Sometimes the secretion of urine begins to come rapidly as soon as the blood pressure commences to fall, and although it be still above the normal, but on other occasions you will find that the secretion of urine does not begin to flow rapidly until the blood pressure has fallen even below the normal. So that, probably, digitalis acts more quickly upon the kidney than it does upon the vessels of the rest of the body.

I should mention also, as corroborative proof of the action of digitalis upon the vessels of the kidney, that the urine which is collected immediately after the stoppage of secretion has passed off, generally contains a little albumen, precisely in the same way as when the secretion of urine is arrested by putting a ligature around the renal artery. Now, it is quite evident that if the blood pressure is already high, you are not likely to get very much diuresis occurring after digitalis and this is what we find to be the case; that in healthy people with a fairly high tension digitalis does not seem to cause much diuresis, but in healthy people

with a somewhat low tension, very marked diuresis may occur in consequence of the administration of this drug, and in people whose circulation is much below par and whose blood pressure is feeble there is sometimes a very great increase in the urine indeed, and this is more especially the case when dropsy has already set in consequence of the feeble circulation.

Digitalis has a local action. If applied to the eye it causes local anaesthesia, but at the same time it causes a good deal of pain and smarting, so that it belongs to the class termed by L anaesthetica dolouroso. It seems to be excreted in the mucous membrane of the stomach and after it has been taken for some time the digestion begins to fail; there is loss of appetite and frequently a good deal of flatulence and discomfort, and this is sometimes the first indication that it is time to stop the administration of the digitalis. If you go on with it you may find that the patient gets worse instead of better, that the secretion of urine begins to get less instead of being greater and that the pulse becomes irregular instead of becoming more

regular and stronger.

The actions of digitalis are due to several principles contained in it. The chief are digitaline, digitalia and digitoxin. They all have an action similar in kind but differing in degree. Digitaline is the weakest, digitoxin is the strongest, but the latter, on account of its insolubility, is not well adapted for use at the bedside. From some of the observations made by Dr. Scholberg and Dr. Rhodes in the Wards, it would appear that digitaline has a greater tendency to cause an accumulative action than the preparations made from the crude drug. The accumulative action of digitalis is one that is well known and by it we mean that after the drug has been given for a certain length of time, although the dose is mainly just the same as before, the patient suddenly shows symptoms of the physiological action; that is to say loss of appetite, nausea and vomiting or you may get a sudden collapse with generally a very feeble pulse, which is not slow, as you would expect, but is frequently very rapid and small and when the patient begins to recover the rapid pulse becomes first irregular and then becomes slow again. In

the case of poisoning by digitalis, for example, if you take a sphygmographic tracing you will find that as the patient begins to recover the pulse is quick with a slow beat interspersed; later on the pulse is slow with a quick beat interspersed here and there, and then a regular slow and powerful action of the heart.

The therapeutic action of digitalis is, first of all, that it regulates the heart's action, secondly, that it assists a failing circulation and, thirdly, that it acts as a diuretic. The regulating action of the heart is best marked by palpitation; where we have an irregular heart and very frequently a small feeble pulse. The failing circulation we notice in cases of mitral disease, either in regurgitation or in stenosis, and it is in these cases that we get most good from the use of digitalis. The employment of digitalis in aortic disease has been very much questioned. You know, that cases of aortic regurgitation come to the hospital for anything. It may be a gumboil, it may be some little dyspepsia, and you examine them and find to your astonishment that the patient has suffered from marked aortic

regurgitation for several years and has had no symptom whatever arising from it. The only thing that may be noticeable is that the face has a peculiar pallor, but otherwise the patient may have gone about his work and made no complaint whatever. In these cases where the failing valve is completely compensated by the increased power of cardiac muscle, digitalis is likely to do no good and may do harm. The harm it would do would be that these patients are in danger of sudden death from syncope and you can readily see that if the heart be slowed more than usual by any drug that we use, there will be greater time allowed for the arteries to become empty, because the blood will be flowing out from both ends - from the arterioles into the veins and from the defective valve back into the heart- and so if we have got a long diastole we may get the arterial system becoming very empty and the patient suffering from syncope. Some of those patients, as you know, die perfectly suddenly. For example, you may be in the Out-patient room. The porter comes and says a man has fallen to the floor off from the bench. You go there and find that, although you have not lost on the whole

more than the outside a minute and a half or perhaps less from the time the porter left the Receiving Room until you got there to see the patient, yet in that very short time the patient is dead; but they do not always die in that way. There is another thing about aortic disease, namely, that the heart gets dilated, becomes hypertrophied and by and by the dilated, hypertrophied heart begins to find the supply of blood it gets insufficient to maintain its nutrition. The thick walls undergo degeneration and become feeble and then the mitral valve becomes too small for the auriculo - ventricular orifice. Then the patient develops all the symptoms of mitral disease. He becomes short of breath, the legs swell and the urine, instead of being as before, large in quantity and of low specific gravity, becomes scanty in quantity and of high specific gravity and frequently loaded with urates. In such cases you find that you have to treat not the aortic disease but the mitral disease, and you must treat it just in the same way as you would treat an uncomplicated mitral disease, namely, by the use of digitalis. There is one precaution, however, that you

must observe in such cases. If they are Out-patients of the Hospital you cannot give them such full doses of digitalis as you would do if the aortic valves were quite perfect. You are obliged to make them come up twice a week or else you must give them smaller doses, and indeed it is always safer if you possibly can to put such patients to bed and treat them with digitalis in bed, because then you avoid completely any risk from sudden syncope.

Is there any risk in the use of digitalis? The chief risk is when the patient rises suddenly and especially if he rises in order to pass water. The reason of this is that it takes in most people a certain time for the circulation to adapt itself to the position of the individual. In old days, before the introduction of anaesthetics, the plan employed in operations in Paris was to put the patient who was to be operated on flat on the ground and then suddenly five or six strong men raised him to the upright position. By doing this the supply of blood was cut off, the blood remained down in the vessels below the level of the heart - at least below the level of the brain - the brain becoming so anaemic that the man

became insensible. It will be clear to you then that the mere position may have a good deal to do with causing syncope, but if the man empties his bladder at the same time the tension in the abdomen is lessened, the pressure in the vena cava is greatly diminished, the blood tends to accumulate in the vena cava and so there is a double tendency to syncope. There is perhaps, however, another risk, which those who believe that the action of digitalis on the blood pressure is only exerted through the heart, have no faith in, and that is in cases where the arteries are brittle and where there is a risk of breaking them with a high tension, by giving digitalis you may cause apoplexy. Many people do not believe in this, but I have very little doubt that it is a fact. A further risk is that in cases where the tension is high and the heart is feeble, the increased tension caused by digitalis may give rise to a feeling of very considerable oppression and may even produce angina. This, of course, you would at once meet by giving some drug which would lessen the tension, and a combination is I think sometimes exceedingly useful in the treatment of cardiac disease. By giving digitalis you increase the strength of the heart, you regulate

its action, you tend to increase the blood pressure, but at the same time you tend to cause contraction of the vessels of the kidney. If, however, you give along with digitalis some nitrite, such as nitrous ether or nitro-glycerine or nitro-erythrol, you may cause dilatation of the vessels of the kidney without interfering with the other actions of digitalis, and such a combination may give you very good results indeed.

Medical Officers of Schools Association.

"THE SCHOOLBOY ATHLETE."

DEAR SIR,

You have doubtless seen the recent publication in the *Times* (and other daily papers) of the letter to Mr. J. Herbert Farmer, signed by Sir Lauder Brunton, Sir Thomas Barlow, Dr. Goodhart, Dr. W. Hale White, and Sir Alfred Fripp, to the effect that school and cross-country races exceeding one mile in distance are wholly unsuitable for boys under the age of nineteen, and are apt to cause permanent injury to the heart and other organs. You may also have read Mr. Farmer's statement to an interviewer, in which he considers that "his contention that the present methods in vogue in public schools, in regard to long distance running, reduce boys to physical wrecks" is "backed by the highest medical opinion," in the shape of the letter already alluded to.

The Council of the Association is not prepared to accept this contention; and it believes that other assertions made in the course of the same interview misrepresent the practice actually obtaining in English public schools; and that, to an extent which calls for effective correction; just as, if Mr. Farmer's descriptions are accurate, the system which they depict would call for a no less emphatic condemnation.

With the object of securing a substantial body of evidence from those personally in touch with the physical side of school life, the Council appeals to the Members of the Association to be good enough to supply answers to the accompanying questions, from their own experience, on the details referred to. It is requested that the enclosed paper, with the answers filled in as far as possible, and signed, be returned to the Hon. Secretary (33, Harley Street, London, W.) *within three days.*

The name of the School to which the replies refer will not be divulged if such a desire is expressed.

By order of the Council, Medical Officers of Schools Association.

W. ATTLEE,
FRED. E. BATTEN, } *Hon. Secs.*
C. J. THOMAS,

February 16th, 1909.

Kindly fill in brief replies, sign, and return in accompanying envelope within three days of receipt.

1.—Do boys run in any *Race* exceeding 1 mile in distance?	1.
If so, state (*a*) distance	(*a*)
(*b*) Lowest and highest age of entrants ...	(*b*)
(*c*) *Any* ill effects observed	(*c*)
2.—What measures are taken to ensure that competitors in races or other forms of exercise are fit to undertake them?	2.
3.—Are boys graded for Athletic exercise by age *only*, or by physical capacity?	3.
4.—Do you know of any cases in which permanent damage has accrued from any School Athletics?	4.
5.—What is the maximum distance of your cross-country runs or paperchases?	5.
6.—How often are they held?	6.
7.—Any ill effects noted?	7.
8.—Do you know of any "school where they train boys for a mile race by running them constantly and continuously from day to day over a distance of a mile—no more and no less"?	8.
9.—In reference to lads who have left school, what cases have you observed of damage to heart or lungs caused by over exertion in school races or other forms of athletic exercise?	9.
10.—Does the $\frac{1}{4}$-mile race entail *more* or *less* strain than the race of	10.
(*a*) 1 mile	(*a*)
(*b*) 2 miles	(*b*
(*c*) 3 miles	(*c*)

Remarks.

Signed..

Date *February*, 1909.

Mr. President and Gentlemen:-

The subject of Exercise and Over-exercise is one in which I have been interested for a long time, and ten years ago I gave an address upon it to the Medical Society of York. I have here a number of copies and any here can have one. The point to be discussed to-day is whether or not school-boys ought to be allowed to compete in Flat and Cross Country Races of more than one mile in length, but this is only one sub-division of a much larger subject. I hope, indeed, that this is only the beginning of a complete consideration of the best methods of physical training for school-boys - methods by which the best results may be obtained for all, and injury inflicted on none. In our school-days we all learned about the bed of Procrustes, and how the robber chief who bore that name caught unfortunate travellers and fitted them to his bed. When they were too long he cut bits off them till they were short enough, and when they were too short he applied the still more painful measure of stretching them till they were long enough. Now a bed in itself is a good thing, but the bed of Procrustes was thoroughly bad. The bed should be fitted to the man, and not the man to the bed.

Now I consider that the same rule should be applied to physical exercises. They should be adapted to the individual boy, and not the boy to the system. My objection to long races, and especially to competition in long races, is that boys have to run in them who are not fitted for them, and who are injured by the exertion. Although I have raised an objection only to mile races for boys below nineteen, I do not consider that these are the only form of exertion which may be hurtful. I have seen cases of cardiac dilatation in boys where I have been obliged to prohibit all games whatever,

and advise the parents to take their children away from school for a time. For if a boy sees others playing it is more than one can expect that he should resist the temptation of joining in. Sometimes when I have given this advice I have seen tears in the eyes of boys who would have borne great physical pain without a sign, and the necessity for a protest by some-one on the part of the weaker boys against over-strain in races is, I think, evidenced by the belief which one writer expressed that there was no injury done by long distance races, because "there had been no complaints from the boys!" We have been told, too, that long distance races can do no harm because the Lord Chief Justice was a long distance runner as a boy. As well tell us that the bed of Procrustes was perfectly harm-less because some men chanced to fit it exactly and escaped unscathed. The Lord Chief Justice did not suffer from long distance races, because he possesses an exceptionally powerful physique, which, together with an equally powerful mind, has enabled him to withstand the strain of a very arduous profession and rise to his present exalted position. But all boys do not possess the same powers, either physical or mental, as the Lord Chief Justice, and some of them certainly suffer injury by having to undertake exercises which are beyond their powers. The exercises should be adapted to each boy, and no boys should be made to go through exercises which, even if they suit a majority, are unsuitable for them.

The only way in which this can be done is by thorough medical inspection of the boys, so that their deficiencies can be ascertained and their exercises adapted to their needs. The majority of boys about the same age will be nearly the same size and strength, but there will be exceptions, some being stronger, and some being weaker than the average. For

their sakes it seems to me that there ought to be classified exercises and sports. Boys, to a certain extent, sort themselves in games, so that in cricket we have a first eleven and a second eleven, and so on. But this is not all that is needed.

The plan that I should like to see in all schools is that which is now in practice in the University of Pennsylvania under the directorship of Professor Tait Mackenzie. Every undergraduate when he comes to the University is examined medically, his deficiencies ascertained, and the kind of exercise prescribed for him that will bring him up to the mark. If the man is thoroughly developed all round no special directions are needed, and the same is the case with boys. But even with healthy men and boys the physique is not always developed to its best by games only. I have been struck sometimes by the weak development of the upper part of the body in some cricketers, while the arms and thorax in boating men were, if anything, over-developed in comparison with their legs.

When returning from the International Congress in Moscow in 1897, I travelled a great part of the way back in the same compartment with Professor Hueppe of Prague, who is not only a great athlete himself, but has given much study to physical training. His opinion was that on the Continent too much attention is given to systematic exercises, and too little to games, whilst in England too much attention is paid to games and too little to systematic exercises. The ideal plan would be a combination of both.

How to obtain this ideal is a question which is not easy to solve, but it seems to me that the best way of doing so would be by means of Colonel Malcolm Fox's proposal that

there should be a Games Master, a man with a University degree, so as to have equal rank with the other masters and be respected by the boys. But in place of taking a degree in Classics or Mathematics he should take it in Education, with special reference to Physical Education. There are many athletes attending the Universities who dislike both Classics and Mathematics, and have no aptitude for either, but who would take up the subject of physical training with energy and enthusiasm. Such men, who should have sufficient knowledge of medical subjects to enable them to determine the physical condition of each boy, and to recognize the effect for good or evil of each kind of exercise upon him, could do for every Public School what Professor Tait Mackenzie is at present doing for the University of Pennsylvania. He could so direct the exercises and games that every boy would get the maximum amount of benefit, and the smallest amount of harm. This proposal involves an action on the part of Universities, of which it is to be hoped they will recognize the advisability and take speedy steps in regard to it.

I perfectly recognize that physical exercise of one kind or another is absolutely necessary for boys in order to ensure their proper development. I also recognize that Watts' hymn, which I had to learn when I was a child "The devil finds some mischief still for idle hands to do" is perfectly true, and boys must be so occupied as to prevent them becoming loafers. Exercise within bounds tends to increase the power of the muscles, of the lungs, of the heart, and of the nervous system. The discipline of games is of the highest utility in training boys to obedience, self-sacrifice, bravery, alertness, and decision, and teaches them how to acquire command over

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The question of physical training has been very carefully worked out in the case of race-horses, and the dictum of a trainer puts the whole case in a nut-shell: "The great thing is not to call upon them for more than they can do."

If called upon to make exertions which are too much for them, without previous training, even perfectly healthy boys may suffer, although with training they could make these exertions with ease. The most perfect example of training, either in ancient or modern times, is the classical one of Milo, the wrestler of Crotona, who became able to carry a full-grown bull on his shoulders by beginning to carry it as a new-born calf, and continuing to carry it day by day until it attained its full size. Every day its weight increased a little, but his strength increased correspondingly, and so he succeeded in performing a feat which would otherwise have been impossible. But, while this shows the advantage of exercise properly directed, his tragic end shows, just as clearly, the evil of contravening the trainer's dictum, and calling upon himself for more than he could do. The lessons to be learned from the ancient story and the modern trainer apply to school-boys as well as to professional athletes and race-horses.

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GASTRIC ULCER.

Clinical Lecture delivered by Dr. T. Lauder Brunton at St. Bartholomew's Hospital on Friday, November 10th 1899.

Gentlemen:- When I was a boy I was allowed to read a few books on Sunday, not very many. Amongst those that I was allowed to read was the Lives of the Covenanters. That sounds a very interesting book, but it was not so interesting when you came to read it and it read somewhat after this fashion. James A. cobbler, caught by the dragoons, taken to the Tolbooth, subjected to the torture of the boot, hung in the Grassmarket. John, B. carpenter, caught by the dragoons, taken to the Tolbooth, subjected to the thumb screw, hung in the Grassmarket. John, C. farmer, caught by the dragoons, taken to the Tolbooth, subjected to the torture of the boot, hung in the Grassmarket. There was a little variation in those histories but not enough to do away with the monotony.

Now, we find very much the same thing amongst the cases of gastric ulcer that come to this Hospital. We find for example Elizabeth A, housemaid, has suffered from

pains in the stomach after food, relieved by vomiting for several months, brought to the hospital put upon rectal feeding for a couple of days, then small doses of milk and lime water and gradually increased feeding, discharged cured. Martha, B. cook, has suffered from pains in the stomach after eating for the last six months relieved by vomiting , brought up blood occasionally, brought to the hospital, put upon rectal feeding for three days, then milk and lime water in small quantities, increased diet gradually, discharged cured. Then, again Mary, C. brought to the hospital for profuse haematemesis, has brought up a large quantity of bright red blood, is completely blanched, is put in bed, kept absolutely quiet gets a dose of morphine and feeding by the rectum. On inquiry when she is able to answer questions, it is found that she has suffered for the last two years from intermittent pains in the stomach, coming on shortly after food and continuing for a varying length of time, relieved by vomiting. The same treatment is adopted in her case that is to say, rectal feeding, milk and lime water gradually increased to custard, bread, fish, pounded meat and

so on, discharged cured. In each one of those cases we find the same symptoms, the same treatment, the same result; so that we get a great deal of monotony although no few cases are precisely alike. But sometimes we get cases that vary a good deal from this general plan. We have had two cases in "Elizabeth" recently which varied considerably. One case is still there; a case where the amount of blood brought up has been so profuse that she has been at death's door, and I asked Mr. Walsham to see her with the possible view of an operation in order to prevent the woman dying from bleeding. The reason why no operation has yet been done is this; she is so very low that I doubt very much whether she will stand an operation, which must necessarily in her case be one of a somewhat severe nature. Because, although we have got the general diagnosis of gastric ulcer, I am not able to localise the position of the ulcer, so that one would naturally avoid opening the abdomen in order to feel about in the stomach for it; and there may be more than one. It might therefore be a very severe operation and I would try to put it

off if I possibly could. We have not examined her much on account of the risk of bringing on bleeding, and we have not put her through any of the regular plans for ascertaining whether she is suffering from gastric ulcer or from some malignant disease. She seems to be improving somewhat and has not brought up any blood for some days, although she apparently is still bleeding, as the motions of the bowels are of a dark colour, apparently due to altered blood. Almost on the opposite side of the Ward was another case which I had no hesitation at all in diagnosing as one of gastric ulcer.

First of all, gastric ulcer is a disease of females and especially of young females somewhere between 15 and 25. It is not confined to women, nor is it confined to those ages, but it is exceedingly common in those ages and it is comparatively rare at other ages. This patient, Florence Thompson, was a waitress in a confectioner's; her age was 22. She was admitted for pain in the lower sternal region. Her history was that she had pain three years ago coming on as soon as the food was taken and

lasting two or three hours. The vomiting was worse in the evening. She never brought up any blood. The bowels as a rule were very costive, never being open without medicine and for these three years, from the time of the first attack until the time of admission, she had suffered from shortness of breath on exertion. Some months before admission she had noticed that the motions were quite dark, and for fourteen days before admission she had been suffering from pains in the knee joints. There was nothing to be made out of the family history except that the mother was somewhat rheumatic. When brought in she looked a pale, anaemic girl. The history seemed to point most decidedly to gastric ulcer. The pain, both in its situation, and the period at which it came on, the time it lasted and its relief by the occurrence of vomiting, all these seemed to point to gastric ulcer. We had no history of haematemesis, but we had a history of melaena, which is I may say quite as good as that of haematemesis. I had no hesitation in heading the board with "Gastric ulcer". When she was admitted, the heart and lungs were found to be quite healthy.

There was a systolic murmur over the pulmonary artery, but this is what one would naturally expect from the anaemic condition of the patient. The liver was felt quite distinctly and was little larger than usual. There was at its left side a little dulness which I did not quite understand and the sternum was found to be more

than usual. Instead of coming down and ending definitely in the xiphoid cartilage it seemed to open up as shown in diagram. Towards the splenic end of the liver there was a little resistance and slight dulness. She was put upon nutritive enemata and appeared at first to be doing very fairly well, but she did not pull up as one would have expected, and although there was no pain on percussion and palpation over any part of that area of dulness, it seemed to me to increase and to run into the dulness of the spleen. So that what struck one after feeling the stomach was that there was a good deal of resistance over the spot where we noted the dulness. One day we observed a very peculiar thing. There was a little knob noticed on the 26th October. It was quite small and hard and projected forward. One could not exactly

make out what it was and I thought that very likely it was the projection of the xiphoid cartilage. In some people you get the xiphoid cartilage bent and coming forward. Then, tremendous pulsation was felt over this dull area, so much so that some men asked whether it was not likely to be a case of aneurism of the abdominal aorta. My own belief was that we had to deal with a case of gastric ulcer which had nearly perforated and had given rise to a limited abscess under the diaphragm, and I thought that the thickness which one felt in the epigastrium was due to inflammatory induration and that the pulsations were transmitted from the aorta to the finger in the epigastrium in exactly the same way as you get them transmitted from one hand to another in cases of ascites ; that the fluid of the phrenic abscess was simply transmitting the pulsation from the aorta to our fingers. I spoke to Mr. Walsham about examining the case and making an incision with a view to seeing whether this was a case of subphrenic abscess or not. The temperature was against its being an abscess, but sometimes you may get inflammation in the peritoneum running

on to the formation of pus in large quantities without any rise in temperature, and I thought that possibly this might be the case. The girl did not seem to be in any great danger and the operation was not hurried. On the fifth she brought up three ounces of blood, the pulse became quick and scarcely perceptible. She was blanched, evidently having lost a good deal more blood than what she vomited. She had a little morphine sub-cutaneously and was fed by the rectum only for 12 hours. Then she had a nutrient enemata, but at midnight on Saturday she became almost pulseless, the sphincters relaxed and she died at 1.40 a.m. on the morning of the 6th. When the post mortem was made I expected to find a gastric ulcer with probably a good deal of blood in the stomach and very probably also adhesions to the abdominal wall with a certain amount of pus between the stomach and the diaphragm. The result was very different indeed from what I expected. Mr. Treves once said to me "Whenever you open the abdomen, expect the unexpected" and this was one of the examples which we found. Instead of

discovering a simple gastric ulcer what we did find was no doubt a large ulcer situated on the large curvature of the stomach about one and a half inches from the pyloric orifice and of a ragged outline with a diameter which is roughly about two to two and a half inches, but around this ulcer there was a thickened mass which was undoubtedly malignant. The pancreas was infiltrated also with malignant disease and several nodules were present in the liver. The liver was not enlarged and the nodules, as you will see on looking at the specimen, were not of a size sufficient to be felt by the fingers palpating externally . The headaches and dulness which were noted during life were due to the thickening of the stomach by the malignant infiltration. The pulsation was due to the transmission of the pulsation in the abdominal aorta not by a fluid, as I had suspected, but by the malignant mass. There are several glands behind which are also filled with infiltrated malignant disease.

Now, this case is very instructive as showing how one can make mistakes, because it seemed to be one

of typical simple gastric ulcer. First of all the age was in favour of gastric ulcer which is very common in young people but malignant disease is very rare at the age of 22. No doubt she was pale, but that is what generally occurs in cases of gastric ulcer. We have found anaemia, but there was no marked sallowness such as is very often found later on in more advanced life in cases of malignant disease. The history was precisely that of gastric ulcer and there was not the history that you more usually get in cases of cancer. Pain in her came on shortly after eating; it was relieved by vomiting, partly due as one would have said to the irritating matters in the stomach being rejected and leaving the stomach in a condition where there was nothing to cause pain in itself; whereas in cases of malignant disease the pain as a rule is more constant. It is no doubt subject to aggravation by food. You may think that the thickening and the dulness ought to have made us suspect malignant disease. No doubt when one sees the post mortem examination one thinks one perhaps ought to have done so, but the

idea that there was simple inflammatory infiltration seemed to coincide perfectly well with the symptoms that we observed and the idea that there was some pus under the diaphragm seemed to explain the transmission of the pulsations of the aorta perfectly well, and moreover as the remarkable pulsation of the aorta was not noticed when she came in but developed rather rapidly, it was natural to think that this transmission was due to something that had been formed rapidly such as pus would be, whereas it did not seem likely that it was going to be formed by malignant disease which grows very slowly. You know that there are certain ways of diagnosing malignant disease from gastric ulcer by investigation of the contents of the stomach. In gastric ulcer the contents of the stomach generally show hyperacidity, the presence of a more than usual amount of free hydrochloric acid, and in cases of gastric cancer the hydrochloric acid is on the contrary below the ordinary proportion. So that if we had washed the stomach out and tested the contents perhaps we should have been more careful about the diagnosis, but even then

we might not have found anything very definite and the objection to using the stomach tube in a case of gastric ulcer is very considerable because you can readily see that if the end of the tube, however soft this may be, should happen to strike upon the bare surface of the ulcer you might cause injury to some vessel in the base of the ulcer, leading to haemorrhage which would not be for the patient's good, to say nothing of a still more disagreeable result, namely that if the ulcer should very nearly have perforated and you struck the base of it with your soft elastic tube the tube might just go through the base of the ulcer and you would get perforation into the abdominal cavity. For these reasons you do not use the tube in cases where you suspect an acute round gastric ulcer if you can by any possibility avoid it, and in the case we are discussing the indications seemed so clear that I did not think of using it. Indeed had I known that this was not a case of pure gastric ulcer, had I known before hand what it was I should still not have thought of using it.

You notice in this case an absence of many of the symptoms of cancer, and it is a case which is a very remarkable one because of the age at which the patient contracted the disease. Now, in relation to the question of a tumour in the epigastrium as evidence of cancer or of gastric ulcer, we may turn to the case of Lily Goddard whose occupation was that of washing at home. Her age was 32, she had pain after food for a little over a month and when she came into the hospital her weight was much below the average, her stomach dilated but there was nothing to be felt. She was put upon the usual treatment, but although the pain became very much less, the tenderness had gone and the weight increased on February 23, yet on March 1st she had again decreased in weight and there was a rounded swelling over the epigastrium. Such a swelling sometimes gives rise to a doubt in one's mind as to whether one is dealing with gastric ulcer or gastric cancer. The history may mislead one because it may indicate that it has appeared very rapidly, and this may occur either in cancer or in ulcer. One of the most important points about it is the evidence of

tenderness. As a rule if it is a gastric ulcer with a lot of inflammatory thickening round it you have to deal with simple ulcer , but if it is a case of cancer you will find very much the same finger end or fingers of palpation, but the patient does not complain of the tenderness. So that if you find the patient allows you to palpate such a stomach with great freedom your prognosis is much more grave than if he objected strongly to the proceeding.

As I mentioned before, the treatment one adopts in cases of gastric ulcer is that of feeding by the rectum first of all and afterwards giving them milk and lime water. The use of the lime water here is two-fold; first of all to prevent the milk from falling in great clots, thus aiding digestibility, and secondly to seal up the mouths of the blood-vessels. Some of you may have noticed once in Rahere the effect of washing some leech bites with lime water. A man was lying in the State Bed in the back ward at Rahere. He had some leeches put on one day. He was suffering from cardiac disease and these bites would not stop bleeding. A great many things had been applied, and when I came down I

found that they were still oozing. I said "Wash them with lime water" and by so doing in a very short time the bleeding ceased . Most of you have attended my lectures on pharmacology, and you will have seen the experiment I generally show of collecting two specimens of blood from the slaughter house, one simply received into a vessel and the other received into a vessel containing a small quantity of oxalate of ammonia. The one in which the oxalate of ammonia is contained does not coagulate, all the lime water being precipitated by the oxalate of ammonia, whereas the blood received in a simple vessel coagulates at once. On the lecture table I generally show that by adding a small quantity of chloride of calcium for example, you cause a coagulum to form before the lecture is over which is fairly though not very firm. By adding a considerably larger quantity you get a coagulum so firm that you can turn the vessel upside down without anything falling out. If you use an enormous quantity you cause a coagulum to form which is not quite so firm You might in a test tube over do it but you cannot in a

living body.overdo the coagulability. The more you can get into the person the quicker will his blood clot, so that in cases of gastric ulcer the lime water serves the double purpose of tending to increase the coagulability of the blood locally and generally and thus to stop bleeding and also tending to lessen the chance of deranging digestion by the casein falling down in large flakes instead of in small flocculi.

REGISTERED TELEGRAPHIC ADDRESS:
LAUDER BRUNTON LONDON.

10, STRATFORD PLACE,
CAVENDISH SQUARE.
W

Sequel of Burbrooks case. [illegible] pain & nausea 1–3 hours after meals

Holmes Vol 6. p 179. always liable to bilious attacks at intervals [illegible]
Sandstein 29: Nov. 1888. For 2 yrs had sickness at intervals & almost constantly [illegible] for 6 months Losing flesh - coffee ground vomiting great flatulence for 20 months.

Greathead -
Hobbes - [illegible]
Godfrey.
Angel - Operation.
Perry sequel to case in last lecture.

H. J. Hobbs age 38 - at school had very severe pains - thought he was shamming - Bowels reg - discomfort barely amounting to pain - not much nausea - stomach was found dilated ~~& gastro-enterostomy was performed~~ on May 29th 1895 due probably to contraction of the pylorus - which may be due to the contraction of the cicatrix of an old ulcer - advised his stomach to be washed out thoroughly every second day & have massage applied to the abdomen - also advised him to take solids & liquids separately

Jan 11th 96 Saw him again - stomach much the same size as before - on passing tube into the stomach the fluid which came out was of a dark claret colour with numerous flakes - & on testing with ozonic ether & guaiacol it showed the presence of blood - advised him to get to bed - & be fed by nutrient suppositories or entirely by enemata - had lost 18 lbs

Jan 30 Operation I proposed was the formation of a gastro duodenal opening - I learnt at this time that he had once swallowed a 10/- piece & that there was a history of cancer in the family

May 2nd 1896 Mr Hobbs writes - I am getting strong & can eat comfortably most things - I wash out the stomach every morning about an hour before bkft & feel as fit & ready for my breakfast as possible - I drive myself about in my dog cart & enjoy myself immensely.

Not heard since

Mrs Johnson aged 24 consulted me in 1883 - had
been quite well till 1877 - then was sick at time
of being unwell & before - continued whole month -
No pain - much flatulence & sickness -
Aug had been very sick
Nov has increased somewhat in weight -
stomach continues to be washed out -
went to Tunbridge Wells - was better for sea
- baths but sick at night - only been unwell
twice since last child was born - now 2
yrs
Oct 19th 1885 - somewhat better - is gaining flesh
tepid bath in morning does her good - sickness
continues - & all her teeth are gone -
Oct 16th 1886 is feeling much better -
Dec 1889 Wrote she had been very sick -
died that month

Vol IX. p 139. Vol X p 240 Vol XIV p

History

<u>Isaac Angel</u> consulted me Nov. 8th - ~~1848~~ 1888 In 1874 got first attack of pain - vomited for 2 days - 1876 spat blood said to be pleurisy - 1879 got cold - in Dec. got similar attack to the one he had in 74 - Bowels reg. much flatulence & vomiting - (Abscess formed & discharged thro navel)

Nov. 15 Not any better

Nov 21 Decided improvement -

Dec. 24 Losing ground somewhat

From 1880 to 1887 in America - constant dyspepsia - 1883 slight attack - 1884 another attack - 1885 another attack - continued at work but was losing flesh gradually 1886 another painful attack 1888 Left America & came to England for change of air - had 6 weeks dieting & massage - no better

Oct 1889 went to Leube Erlangen - stomach washed out - nothing abnormal - 18 days after had lost 30 lbs - stomach washed out - blood middle of Feb - confined to bed - vomited at night - he passed grayish hard crumbly matter like old plaster from a house - 4 or 5 days later vomited blood - got better went to Jerusalem - later found lump growing larger & very hard -

Jan 1891 Had an operation - an opening being made connecting the stomach & intestine - this gave him much relief & he seems in a fair way to get well -

Feb 2nd - seems much better - indigestion

Not heard since -

James H. Greathead consulted me Oct 28 - for about 4 yrs had suffered from flatulence but had gradually got worse - Some sickness in morning - much flatulence - raw feeling in epigastrium -
Aug 89 - saw him again - contd about the same or worse -
Nov 26 1895 Has been fairly well - but recently has suffered more or less from ~~m~~ nausea pain sickness & flatulence - warm weather agreed with him - got dyspeptic in the cold weather - the difference between his stomach in 87 & 96 is that he has now got a hard lump which moves with respiration - believed he had contraction of the pylorus associated with catarrh & possibly ulceration - trust the thickening is of an inflammatory nature & not malignant - advised gastro-enterostomy
Feb. 18th 96 I wrote to Dr Fox that all his organs were sound but the stomach was somewhat dilated - thought there was a tendency to proptosis or contraction of pylorus -
June 29 96 saw Booth gave him Sod Bic been better - now more pain & flatulence again - when he vomits it is 3 or 4 hrs after food - has pain almost continually in left shoulder blade -
July 20 96 got chill - since then diarrhoea - chiefly in night - motions quite fluid brown - Oct 14th
Oct. 20 96 Operation had been performed - but he began to fail quickly - operation caused no pain or peritonitis - & wounds healed - sank from exhaustion - previous to the operation he had been put to bed & fed entirely by the rectum with no good result - died from exhaustion after the operation in Oct.

Mr Wright consulted me Feb. 6th 1893 - I wrote to his doctor saying I could not find any organic mischief & that there was no dilation of the stomach such as one usually finds in pyloric obstruction His knee jerks are entirely gone - walks fairly steadily oscillates somewhat - I believe he has got gastric crises - shall be able to judge better after he has been a little time under observation
Nov 20 there was a doubtful abnormal sound at the apex of the left lung - the stomach was dilated & there seemed to be a somewhat similar condition in the bowel - advised rest in bed & massage & when strength had increased to go ~~to~~ to St Moritz or Meran - His Mother wrote he was very ~~dee~~ nervous about himself - afraid to eat - subject to chills & feverishness
Dec 2nd brought in an ambulance to Eccle's house - apparently under conditions of brain starvation unable to act or think reasonably -
Dec 8th post mortem took place - every organ normal except the stomach - which was found to be dilated & the mucous coat very oedematous along the lesser curvature especially

Capt Darvall June 30th 1896 consulted me - went abroad 6 months before th vesical catarrh - was sick every night during night - vesical catarrh disappeared - much flatulence - some pain - much sickness bring up mucus & sour stuff - F. Treves operated gastro-enterostomy - cancer of the pyloric section of the stomach - after the operation I heard that Darvall had been shooting but Dr Magrath wrote he did not think he had been out shooting - but he picked up at once after the operation & put on flesh fast & until the middle of October was in excellent spirits - then lost appetite - & appeared to fail suddenly - gradually the liver enlarged - had symptoms of bowel obstruction which yielded to treatment but in about 5 weeks died of exhaustion

W. H. Barbrook consulted me Nov 27th 1896. Fell ill in March - fulness - pain - eructation - acid - When I saw him had marked dilation of the stomach & fulness & hardness round the umbilicus. It was somewhat indefinite in America & seemed to move occasionally & not be in the rectus - & it did not move so freely as a tumour of the stomach usually does. If one was passing a clinical examination & had his case to diagnose one would naturally say that he had a dilated stomach & a contracted pylorus most probably dependent upon malignant disease - One hopes it may be not malignant - but at the same the continuous loss of weight - the symptoms & the age make one very apprehensive - I quite agree with you in the advisability of washing out the stomach every morning - but should not do it more it than once a day - the vomit he brought up was very acid indeed - contained a large amount of chloride & no hydrochloric acid could be detected - the bowel should be washed out by means of an enema once a day - A little gentle massage to the abdomen might do good but must be very gently done otherwise it may do harm - if he continues to lose weight he had better go to bed & be kept there. On Feb. 1st 1897 the stomach was much dilated & there seemed to be two nodules one in ordinary position of pylorus - another further down to the left - I should recommend an operation - Feb. 6 - Mr Barbrook had jaundice - Feb. Operation ?

Clinical Lecture on ENDEMIC HAEMATURIA.

Delivered July 10th.1896.

Clinical Lecture on Endemic Haematuria.

Delivered by Dr T.Lauder Brunton. F.R.S., at St Bartholomew's Hospital on Friday July 10th.1896.

Gentlemen: To-day we have the opportunity of looking at some things that do not usually come our way. We have in the Wards a case of endemic haematuria, a condition which is due to the presence of a parasite. Haematuria - the urine containing blood - may be due to a large number of causes. It is generally a condition which occurs in individuals, and is not to be found in a large proportion of the population, except in certain districts. In this country, for example, it is not unfrequently due to injury. At football a man is thrown down and somebody else in the scuffle kicks him in the loins. The unfortunate man is taken home, and it is found that the next water he passes appeared to be almost pure blood. The injury has ruptured the kidney, and so you get a large amount of blood passing in the urine. A blow may have a similar effect; the kidney in both cases being injured from without. It may, however be injured also from within by the presence, let us say of a calculus in the pelvis, which often remains quiet when the man is at rest, but begins to move up and down when the man moves about, or is shaken in a railway carriage, in a cab,

or in an omnibus. In many of these cases where the injury is due to the presence of a calculus, you may find that the urine is free from blood entirely for a while, and that the blood comes on quickly after exertion or after shaking and subsides quickly again after rest. We have met haematuria due also to growths of various kinds, depending upon the presence of low organisms, animal or vegetable; as,for example, in cancer or in tubercle. We also find, however, that certain animals produce haematuria to a very great extent, and that these animals are distributed widely in certain districts; so much so that a large proportion of the population suffers from haematuria, and in these parts the disease is, as it is termed, endemic.

Haematuria is generally recognized by the colour of the urine to a certain extent. The colour of the urine varies from a smoky appearance to a distinct red colour, and occasionally you may find even clots. When the blood comes from the kidney, it is generally well mixed with the urine, but if it comes from the lower passages, from the urethra or from the bladder, you will not unfrequently find that the urine which is passed first is coloured deeply with blood or may contain clots, while the latter part of the urine if free from blood. This is not so when the blood comes from the kidney, because in such cases you find that the whole of the urine contains blood. One

cannot, however, depend merely upon the colour of the urine for a diagnosis of haematuria. You have to apply various chemical tests. One of these simply is for albumen. You know that although albumen may be present in the urine without blood, blood cannot be present in the urine without albumen, because the blood itself contains albuminous materials, and, therefore, if blood be present albumen is present even although there be no albumen more than what is actually contained in the blood. One of the commonest tests for blood, as you know, is the application of guaiac and of ozonic ether. Guaiac resin is readily oxidized, and after it has undergone oxidation it becomes of a blue colour. All protoplasm has the power of transferring oxygen to the guaiac and of rendering it blue. This blueness occurs very slowly unless to the protoplasm you add a certain amount of a substance which will readily yield oxygen, and this we have in the form of ozonic ether - a solution of peroxide of iron in ether. If we pour this upon the surface of a mixture of guaiac resin with blood, we will find that the blue colour will develop at the spot of junction; the rapidity with which this develops and the depth of colour usually being brought nearly in proportion to the amount of blood present. You will see that in the specimen before you there is a good deal and in the second we shall probably find even a more rapid

development of the blue colour and a deep tint with it. In No. 1 almost immediately we have the whole amount of fluid in the test tube becoming of a very dark blue colour indeed. The tranference of the oxygen from the peroxide of hydrogen to the guaiac, as you see, has been exceedingly rapid and exceedingly complete. Another way of testing for blood is by the microscope, and under the microscope you will see blood appear in various forms. You may get the regular concave disc, or you may have this so far altered as to appear almost like a colourless bladder, or instead of having the corpuscle swelled and rounded you may find that it is crenated and shrunk. Another method that has been introduced for the purpose of showing the presence of blood, is known under the name of Hellyer's Method but I do not think it has any special advantage, and it is I think comparatively rarely employed. It depends upon the carrying down of the colouring matter of the blood with phosphates; that when you mix the urine containing blood with some liquor potassae and boil it, the phosphates tend to be precipitated and the precipitate is then coloured more or less deeply of a brownish colour from the decomposition of the altered blood colouring matter along with the phosphates. In the specimen you will notice that as it goes on boiling we get a deposit which will be of a brownish colour. Another method

is that of the spectroscope. In the spectroscope you get with ordinary oxyhaemoglobin two bands in the green; that if the blood has stood long enough and is deprived of oxygen, you get a band occupying very nearly the interval between the two ordinary oxyhaemoglobin bands, and that very frequently if the blood has stood a length of time you get some altered haemaglobin; you get indeed a little band down the orange, which is that of haematin.

As I have said, there are various countries in which haematuria occurs endemically. These are practically the coast of Africa. You find haematuria apparently occurring all along the coast or nearly all along, but the haematuria that is found on the West Coast occasionally is said to be due much more to malaria than to the causes which produce the haematuria of the East Coast. But in Tunis, in Egypt, in Zanzibar in Natal and in the Cape, you find endemic haematuria which is due to the presence of a small organism which has different names. By some it is called bilharzia haematobia, in honour of the man who described it; by others it has been called a small trematode, and the two worms, male and female, live together in very close proximation. You can see them here after the lecture arranged upon a glass slide. I give you a drawing, as seen under a moderately high power. The shaded part is the male animal.

It is more or less flattened, and at one end the two sides of the body are curved together, so as to form a ______ in which the female animal, which is longer than the male and nearly cylindrical, lies. This conjugate animal finds its way into the stomach and intestines of a man or a boy and gets from the intestinal tube into the portal vein and its branches, the splenic vein, the mesenteric veins, the veins of the rectum and bladder. There this animal lives and thrives upon the blood; eggs are produced and these eggs are extruded into the blood, and find their way through the walls of the veins into the intestinal tube, into the kidney, into the ureter, into the prostate and into the bladder, giving rise to a good deal of irritation in all those situations. In the intestinal tube they may give rise to ulceration with symptoms of dysentery; in the bladder they may give rise, of course, to a great deal of irritation, with symptoms of cystitis or vesicle eczema. In the kidney or ureter they give rise to a considerable amount of bleeding. The eggs are of a somewhat oval shape with a point at either end, or at the side, and inside this egg is to be found the coil of embryo, and this embryo shows on its margins a number of cilia which are frequently found even inside the embryo to be in brisk motion. After the egg has been passed

out of the body, and sometimes also in the body, it breaks, the embryo becomes loose and swims about by means of the cilia. In ordinary urine it very soon dies and breaks up, but apparently in water it does not always break up so quickly but swims about for sometime until it finds a proper host. Now there has been a good deal of difficulty about ascertaining what the host of this creature is. It is now supposed to be some minute crustacea. Into the body of this the embryo bores its way, lives there for a while and then when the crustacean is swallowed by the man or the boy, it finds its way from the intestinal tube into the portal vein and goes through the same series of changes as I have just described. You will notice first of all in the specimen the adult animals mounted upon a piece of glass, and in the other you will see one of the eggs with the spicule at the end, and the embryo inside. In the one which has moved a little you will see not only the embryo but the cilia, but it is not in motion. These specimens have been obtained from a boy who has come to this country from South Africa. He had been bathing in a river called The Shark River, and was supposed to have got the embryos in through the skin, but this is, of course, a thing that is very unlikely. It is almost certain that somehow or another he had swallowed

water containing small crustaceas in which the embryos had found an intermediate host. The patient presents few or no symptoms beyond the fact that his urine contains a considerable amount of blood and albumen. This was discovered accidentally in the course of influenza, from which the boy suffered about a couple of years ago. The presence of the parasite does not seem to reduce the patient's strength quite as much as one would be inclined to imagine, but at the same time a man cannot go on losing a quantity of blood from his kidneys without suffering ultimately. Of course, the question of diagnosis arises before that of treatment, but the question of diagnosis is settled very quickly upon examination of the microscopic sediment from the urine. When you find the characteristic ova, which is to be seen under the microscope, there can be no question whatever about the diagnosis, and then comes the question of treatment.

Now no doubt many different plans of treatment have been adopted, but for my own part I do not quite see what plan of treatment is likely to do very much good. In order to cure the patient one would require to introduce into his portal veins some drug which would prove fatal to the worm, and would not prove fatal to the individual. Now you can readily see that any drug sufficiently powerful to kill a worm of this sort

is very likely indeed before it gets into the portal vein, or when it gets there, to do much mischief to the delicate tissues of the organs with which the portal vein is connected. I do not know really where there is any drug likely to do good. There is a drug which is useful in a somewhat similar condition - the Anckylostoma. You know that at the time when the St Gothard Tunnel was bored a number of the Italian workmen began to suffer much from blood which was passed from the intestinal canal. On examination it was found that the blood was due to the attacks of a small worm upon the duodenum. For a good while remedies were tried in vain to destroy this worm, but one which was apparently successful was thymoil in large doses; doses of about a gramme several times a day. This is a large dose of thymoil and is large enough indeed to give rise to very uncomfortable symptoms in the patient who is taking it, but you can readily see here that the thymoil has a very great advantage in killing the anckylostoma to what it would have in killing the distomum, because in the former case the worm is free in the intestinal tube and the female will come directly in contact with it, whereas before the thymoil can reach the distonum it has to be absorbed into the portal vein and will there will become greatly dilated with the blood contained in the vein ; so that it will not be able to reach the parasite in anything like the same concentra-

tion in the vein that it would reach the anckylostoma in the duodenum. We have not tried any treatment in this case, excepting the general treatment in cases of albuminuria. The idea has been in my mind rather to keep the patient alive, to make him as strong as one could, and thus, if possible, to prevent his being weakened by the drain upon him, and allow the parasite by and by to due out. One does not, however, know what the length of life of the parasite is, nor does one know how soon the conditions in the portal vein are likely to prove obstructive to its continuous generation; because even although the life of an individual distonum be shot, you may get them going on propagating week after week, month after month , and year after year. So that at present one does not know what the result of treatment will be.

Hitherto in the countries where the distonum prevails, treatment has not been successful, but one would hardly expect it to be so because a great number of patients who suffer from endemic haematuria are subject to continuous infection from the water they drink, and so far as I know we have very few examples of cases that have been treated in those countries, and where they have been treated long enough to establish the duration of the disease or effects of treatment. The medicines that we have been giving to this youth are simply acetate of iron, ace-

tate of ammonia, and under the effect of the these drugs the amount of albumen appears to have somewhat lessened; but I think it is highly probably that we may find that the amount of albumen and of blood will vary a good deal from day to day, and what the ultimate result will be I cannot as yet say. We shall, however, try the various remedies and see whether we can find anything. One of the first that suggests itself to you no doubt is santonin. This was formerly looked upon as a powerful vermicide, but has now been shown to be only a vermifuge. Instead of destroying lumbricae, as formerly it was supposedto do, it has been shown simply to make them drunk. Some gentleman tried some experiments with lumbricae; putting them into a solution of santonin, much stronger than any with which they could possibly meet in the human intestine, and found that they were not killed, but that they seemed to get drunk at once, and did not know what they were doing at all. Santonin had such an effect upon them that they went about vaguly through the liquid, and probably the effect of santonin in the body as a vermifuge is simply that those creatures lose their orientation and are not able to prevent themselves from being swept out by a powerful purgative; although when they are in their right mind they seem to know exactly what place they are to occupy and thus they prevent themselves from being affected

by the purgative. We may, however, give it a trial with a number of drugs that were tried some years ago for various parasites in the liver. There is another one the distonum hepaticum, nearly allied to the one of which we have been speaking, which is found frequently in the liver, and this occurs a good deal in Iceland. There was a doctor in Iceland, Dr Hjaltelin of Rekjabik, who died a few years ago. He tried a number of experiments upon the effects of drugs on the parasite in the liver. He had a great number of cases to deal with, because these parasites are very common in Iceland, the people living upon imperfectly cooked food, so that the germs are readily conveyed into the mouth, and the germs conveyed in various kinds of meat are not destroyed by cooking. He tried all the ordinary vermicides, and practically the result of all was nil. Not a single one did any good whatever. The treatment in the case I have brought before you is by no means a very hopeful one, but at the same time we must try and do what we can for the patient.

H E A D A C H E.

Clinical Lecture delivered by T. Lauder Brunton, M.D. F.R.S.
on Friday June 9th 1899. at St. Bartholomew's Hospital.

Gentlemen:- However interested doctors may be in their patients, however anxious they may be to forward medical science, there is not one of their patients in whom a doctor takes so much interest as in himself and there is no disease that he studies so successfully as the one with which he is himself affected. You will often notice the remark made that medical men have frequently died from the disease about which they have written, and it would be very strange if they did not, because it is the very symptoms of the disease which they observe in themselves that lead them to study that disease and to write about it. It is for this reason that I have taken to-day the subject of headache. I have suffered so much from it myself that I have naturally taken interest in it and I have managed in many cases to cure men of headaches, and probably what I say may be of interest to some of you personally in relation to the treatment of your own cases, and to others it may be interesting as helping them to relieve their patients; because the number of people who suffer from headaches is very great indeed and the

number of medical students who suffer from headaches is perhaps much larger in proportion than among the general public. It is quite natural that it should be so, because they have got a great deal of reading to do, they are prevented from taking much exercise by the closeness of their studies and especially before an examination they have an extra strain thrown upon them and often a certain amount of anxiety. All these things taken together tend to bring on headaches which interfere very seriously with their getting through their examinations, because the headaches prevent them from doing the work they would otherwise do. Now, what is a headache? We might define it as a pain in the head, but all pains in the head are not headaches. We get a pain in the jaw, we may look upon that as part of the head, and we call it perhaps a toothache. A pain in the ear, we call that an earache. We have a pain really in the head and we do not call it a headache because ~~xx~~ it is limited to a certain spot and affects the trunk of a certain nerve and we call it neuralgia or brow-ague. By ~~hede~~ headaches we generally mean a more diffuse pain in the head which is somewhat difficult to localise and cannot be

connected distinctly with either a tooth or an ear or a branch of a nerve. The cause of the pain in the head is very difficult to determine. I have looked up a good many books to see what was said upon the subject and I find that I can get very little definite information about it. Of course, we know that all pain depends upon some affection of the sensory part of the brain, and we may have pain in the brain without any corresponding lesion of the periphery. But, in most cases we find that there is a corresponding lesion in the periphery which gives rise to the sensation in the brain, and this localization at the periphery is of service to us in trying to remove the lesion which is giving rise to the pain. The pain itself is an advantageous circumstance, because when no pain is felt the patient is apt to cause injury to himself For example, you know the story of the man who was in the lunatic asylum. He put his hands into the candle and lighted his fingers and held them up before him and admired the blaze. He did not feel any pain and thought it was a very nice thing to do. If he had had pain he would not have so injured himself. Pain is generally an indication of some irritant, some injurious thing that you have to get rid

of and one has to try to find out as best one can what the injury is.

Now, the pain in headache we may agree is almost always due to an irritation of some sensory nerve, but the pain is not always felt at the place where the sensory nerve is injured. It is with the head as with other parts of the body, and an irritation that is inflicted upon the ulnar nerve, by twitching the so-called funny-bone, i felt perhaps more in the knees and the fingers than it is in the trunk of the nerve itself. So in the head we may find that the pain is really of a reflected character and that it is felt at some part of the head distant from the place where there is an irritant present. No doubt in certain cases the pain is caused by pressure upon the ends of the nerves, sometimes by continued pressure, which we notice in the case of the frontal headache of a common cold. There, in all probability , the nerves are stretched or pressed upon by the thickened mucous membrane, more especially the thickened mucous membrane in the frontal sinuses, where the compression of the mucous membrane between the layers of bone which surround it prevent

it from distending as it otherwise would. Wherever you have got nerves along with vessels in a limited space, where expansion is prevented, there you always have the conditions for pain and very often for severe pain, wherever there is inflammation of an unyielding substance, whether it be bone, fossa or whether it be mucous membrane in an enclosed space, there you may have severe pain. The pain depends no doubt, then, upon a local cause, but it depends also upon a general cause; because you may find that people have got a local cause sufficient apparently to produce pain, and yet the pain is not always there. Take for example a corn. A man may have a corn for weeks and months together, but it does not always trouble him. He may be perfectly unconscious for days together of the presence of that corn, but if somebody treads upon it he is very soon conscious of its presence. There the nerves in the corn have been injured by the pressure and one can readily trace the connection between somebody stamping upon the tender corn and the subsequent pain. But at other times there is no apparent reason for the pain ~~occurring~~ occurring, and yet all at once that corn will begin to sting as if a red

hot iron had been bored into it; and it is not easy always to find out why. Not unfrequently the man feels pain in his corn because he has got his digestion out of order; not unfrequently, however the digestion may be alright and the pain is felt in the corn because of the change of weather, or it may be that the weather remains the same, the digestion alright and the man goes into a crowded assembly. Let us say, he goes to an evening service in church and the pain in the corn begins to come on most severely. Why is that? No doubt, in some cases it is connected with alterations in vascularity. It has puzzled me a good deal to understand why a corn should sting so in church, and it has puzzled me also to find out why people go to sleep in church. It seemed to me that the same condition that in one man might bring on stinging of the corn which keeps him awake, brings on sleep in one in the neighbouring pew. In both I believe it is due to a relaxed condition of the vessels causing increased pressure in the corn and either pressing or filling the ends of the sensory nerves in the toe. But why they should come about I cannot definitely tell you. I suspect it, but I do not know. The cause has

been said to be due to the warmth of the crowded church, and then it has been put down to the accumulation of carbonic acid; but you find warmth and carbonic acid in other places and you do not get the corn shooting and the person falling asleep. I am inclined to believe, although I have no proof of it, that this condition is due to the presence of hydroxylamin in small traces. This is a substance which dilates the vessels just like nitrate of amyl, and a trace of this in the air would in all probability give rise to dilatation of the vessels in the body generally, leading to sleep in some, and dilatation of the vessels in the periphery, leading to stinging of the corn in others.

Now, there can be little doubt that in the brain we may have two different kinds of irritation, just as we may have in the toe. We may have the continuous tremendous pain within the head due to the presence of a tumour which is stretching the fibrous structures within the skull, and thus giving rise to intense agony. We may have the milder but still more or less continuous pain due to pressure upon the nerve fibres from the thickened mucous membrane in the frontal sinuses or elsewhere,

as I have just mentioned: or we may have a pain which is of a curious throbbing, shooting character and which localizes itself very often not only to one side of the head, but to one particular part of one side of the head. This latter is one of the most common forms of headache, one of the most interesting and it is often known as migraine. I mention it perhaps more especially because I think the investigation of it will throw some light upon the nature of headache. A number of years ago du Bois Reymond who suffered from this found that the temporal artery upon the affected side of his head was much contracted. Liveing, who has also suffered very much, found that the artery instead of being contracted was widely dilated. Here there seemed to be then a complete contradiction between two good observers, both of whom had suffered from apparently the same disease. In my own case what I found was this; that generally the temporal artery of the affected side was painful and was contracted, seeming to be like a bit of whipcord under the finger; but at other times, while the headache was apparently exactly the same as before, the temporal artery instead of being contracted was widely dilated. So

that in my own temporal artery I was able to observe two conditions which had been noted by du Bois Reymond on the one hand and Liveing on the other. This led me to pursue the artery a little further both forwards and backwards and then I found that there were always two conditions present. There was a proximal dilatation and a peripheral contraction. If I found for example one day that the temporal artery was widely dilated, if I simply followed it up to the forehead I found that the branches passing from the temporal artery were so firmly contracted that they felt not merely like whipcord, but like little bits of piano wire under the finger. At the same time, if I followed the artery backwards I noticed that the carotid was widely dilated and throbbing furiously, the apparent size of the artery being three times as great as usual. It seemed to be ~~xxxxxx~~ not like the ordinary size of the carotid, but almost as thick as one's thumb, and was pulsating violently. This has led me to believe that in all these cases of ~~migrxme~~ migraine there is proximal dilatation and peripheral contraction of the vessels, but what has this got to do with the pain? The pain in these cases I believe is like the pain of colic, where you

get intense pain in the intestine from abnormal contraction of some parts of it, this abnormal contraction being usually associated with dilatation of the muscular fibres in the other part; so that there is a disturbance of the relationship between the different parts of the muscular tube. To make sure that the pain was due to the condition of the vessels I ~~had~~ have pressed upon the carotid and stopped the circulation. This at once stopped the pain in the head and I should have been glad to continue it, but for the fact that it is almost impossible to press upon the carotid and stop the circulation within it without pressing at the same time upon the vagus nerve, and pressure upon this causes such a feeling of compression on the chest that you are obliged very shortly to take the thumb away from the carotid in order to breathe freely again, so you stop the pressure, although it gives you relief, and the moment you do stop it, it feels as if a hammer had struck through the head. There is intense pain shooting through the head and if you again renew the compression you stop the pain, but you are compelled again to cease pressing

for the reason I have just mentioned. So that, as we are able to remove the pain at will by stopping the circulation in the carotid I think we may assume without being far out that the pain is due to the distension of the peripheral part of the artery by the extreme pressure thrown upon it through the relaxation of the proximal parts of the artery. This I think is borne out by the effect of position. You know that in a case of aortic disease we may have throbbing arteries. If you want to get the throbbing made more perceptible even than it is in the ordinary position, you hold the patient's arm up and then you get a tremendous shock with every systole of the heart and a tremendous fall with every diastole. Something of the same sort happens with people suffering from migraine. As a rule those people are obliged to lie down on account of the pain. So long as they sit up their head throbs so severely that they can hardly bear it. Sometimes too, you may relieve such pain by compression of the veins: putting the hand round the throat and as it were partially choking the patient. As the face gets livid, so the pain in ~~xx~~ the head seems to

disappear, and this I think is just due to an equalization of the circulation, the reverse of what one notices by sitting up. There are however, certain headaches that instead of being made easier by lying down are made worse. In them the pain is so great that the patients are obliged to sit up or to lie propped up in bed with their head high. These I think are cases usually where the tension is very high in the arterial system, and where there is not the same variation in the tension that there is in the ordinary cases of sick headache. More especially I think that these cases of headache which are not relieved by lying down are to be found in men suffering from gouty kidney, where the tension is continuously high and where the vessels are extremely contracted. Why do those vessels undergo this change? Both arteries and veins are very liable to undergo local alteration from local irritation. Many years ago when working in Ludwig's laboratory in Leipsig, I made a series of researches upon the alterations which vessels undergo when separated from the nerve centres, and one can observe, both in arteries and veins, a rhythmical contraction. In some you may observe something

more than a rhythmical contraction, namely, a regular peristaltic contraction. The tissue we generally selected was the rabbit's ear on account of the readiness with which the vessels in it can be seen, although frequently the veins of the mesentery were employed. If you touch either of these with a hard point and watch the vessels under the microscope you will find that sometimes you may get a local contraction and a limited contraction in the vessels, at other times you may get an equally marked limited local dilatation. For example, diagram represents the normal vessel and you apply irritation at A. You sometimes get it contracted, as shewn, but at other times you may get a regular dilatation occurring. Now, you know that changes in vessels apart from the local irritation are usually due to alteration in the vaso motor nerves and it would appear that in headache there is such an alteration.

There is a curious variety of sick headache in which the pain will leave the forehead or temple for the time completely and will then go to the occiput; it will then leave the occiput and go back to the temple. Well, the explanation that I should give of such a condition is that the vaso motor centre

is in a state of unstable equilibrium and that sometimes it has caused disturbance of the equilibrium of the vessels in the occipital regions and at other times in the temporal region. But this does not help us yet; we must go still further back and find out why the vaso motor centres have got disturbed, and one of the most common disturbances is a decayed tooth. I remember on one occasion seeing a clergyman who had been almost disabled by severe headache. He had been to several German Spas, had taken a great deal of medicine and his headache was no better. Thinking that possibly there might be some reflex cause, I took a bodkin and tapped all his teeth in succession. At last I found one that was tender to percussion. He went to see a dentist who found that caries was just beginning in the tooth. He stopped the tooth and the headache ceased. In very many cases you will find that you may stop the headache by treating the teeth. In such cases there are frequently two distinct pains, localized pain in the teeth and the headache somewhere else in the head, a dull pain quite as severe as the toothache and which the patient never dreams of connecting with the

latter. Both the headache and the toothache may often be relieved by treating the teeth. In cases where a single tooth has got a hole in it, you may plug the hole with a little bit of cotton wool upon which you have placed either some strong carbolic acid or some bicarbonate of soda and laudanum. There is another toothache and headache combined which arises from irritation of the whole of the teeth. The acid saliva in the mouth irritates the teeth just at the junctions with the gums, and pain often comes on after a meal, because the saliva lying in the mouth has become acid and when food is taken more saliva is secreted and washes the acid saliva up along the gums, so that the roots of the teeth become irritated. Of course, if the patients go on eating for a while there may be sufficient alkaline ~~secretx~~ saliva secreted to neutralize any acid in the mouth and so the pain, which is at first not, may be relieved by the eating, but you can generally relieve it a good deal more quickly by washing the mouth out with a weak solution of bicarbonate of soda. The most common perhaps of all causes of headache is not the teeth but the eyes. Most people

fancy that their eyes are equal and good until you come to test them and then it is found that there is some little inequality in the focal distance of the two eyes, some little astigmatism, some little want of power of convergence or something of that sort. So long as these people are not doing anything when they are out in the open air and not using their eyes specially, they do not feel the inequality in their eyes, but when they come to do any work, reading or looking at pictures or by straining their eyes in fine needlework then ~~they begin to find~~ their defects begin to find them out. Oddly enough, however, many people do not know that what they are suffering from is defect in the eye. What they complain of is pain in the head. The pain in the head due to ocular defects is very often frontal, perhaps more so than any other kind of pain, but it is not at all unusual to find it also at the back of the head. More than that it may not be merely occipital, it may be right down on the back of the neck. I saw a very extraordinary case some years ago of a patient who had come from the States of America to see me. She was the head of a Ladies College and for two years had

been suffering from intense pain in the neck. She had tried all sorts of things and had failed to get rid of it. The pain was so severe that she could not continue her work and she got a couple of years leave. When I saw her the pain was so low down that I thought it must be due to some irritation in the cervical vertebrae. I got my friend Dr Ferrier to see her with me and he also came to a similar conclusion. Neither of us had seen any pain so low down in the neck due to any irritation of the eyes. It never ~~occurred~~ occurred to either of us until just as the lady was going back to America ~~Shx~~ she having been to the Continent and tried everything and was going back in a state of despair. She suddenly told me that a cousin of hers had had a pain very much like the one she complained of and she went to an oculist and was now quite well. Then the truth flashed upon me and I recommended her to go to an oculist, have her eyes examined and be fitted with a pair of glasses. She did so and in three months afterwards she wrote to me from Massachussetts to say that the pain which had been plaguing her for the last two years had now entirely gone. Another case I saw was that of the

sister of an old College friend. She had had the pain for 35 years and she looked upon it as a dispensation of Providence. She did not like to come and consult me because she thought it was rather interfering with Providence. However, her brother said he did not quite take that view and insisted she should come. I did not do anything for her, but I sent her to one of my colleagues who examined the eyes and provided her with a pair of glasses and in three months that dispensation of Providence was entirely gone. There is another symptom closely bearing upon this which it may be worth while just to mention. A man came to me from South Africa complaining that he thought he had got a tumour in his brain. He was unable to do his work. When he sat down to his books he could see everything alright for five minutes, then everything went round and he could not add 2 and 2 together. I examined him and did not find anything wrong with his nervous system, but he wanted glasses. He got them and went back perfectly well, the cause of his symptoms simply being that when he began to look at his books, with a great effort of will he could focus his eyes to see the figures, but in five minutes or so his ciliary

muscles were quite fatigued. He was no longer able to focus the eyes and he could not see anything more. Whenever then you get a patient complaining of headache, always examine the eyes and the teeth, but you must not merely examine the eyes in regard to their focal distance, to see whether the two are equal or not, but you must also take into consideration their power of convergence. There was a student here working for his examinations and I tried all I could to relieve his headaches. He was going up for the London University and he got a pair of glasses which did not do him any good. Both he and I were rather in despair, when we sent him to Mr Jessop who found that his power of convergence was deficient and by providing him with wedge-shaped glasses the man passed his examination alright and has been free of headaches ever since.

Another source of headache is the nose and that is one that is very often neglected. When you find that there is no cause for headache in the eyes or in the teeth then you look to the nose and see if there is not something there. You may find

that there is swelling of the mucous membrane of the nose, something gone wrong with the turbinated bones or the septum, an accumulation of mucus in the posterior nares, sometimes also an accumulation of pus may have occurred either in the malar bone or in the ethmoidal sinuses. I ought now to go on to discuss the general conditions which give rise to headache but there is not time, and I must just mention for the use of those who may be going up for examination and who are suffering from headaches that where such headache over the eyes is combined with constipation it is usually benefited by the haustus magnesii sulphatis of this Hospital three times a day. Headache just across the eyes without constipation is benefited by the haustus acidi nitrohydrochlorici; a little higher up still without constipation is benefited by an alkaline draught before meals, the haustus calumbae alkalinus, but the greatest advantage that one gets in the treatment of headache is from the combined use of bromide of potassium and salicylate of soda. I told you at the beginning of this lecture that I used to suffer dreadfully from headaches. I am glad to say now that I do not. I can always keep them in order simply by the use

of these drugs. The dose one generally uses is about 15 to 20 grains of salicylate of soda and 20 to 30 of bromide. Either of those alone has not the same action as the two combined, and it is rather important too that you notive the kind of salicylate that is being dispensed, because if you use either the ordinary salicylate of soda or the physiologically pure salicylate of soda the patients may not be able to take it, but if you use the natural salicylate made from the willow then patients are able to take it and great good results from its use. Therefore although in Hospital practice you may be obliged to use the artificial yet if patients can afford it you better let them use the natural. It is a certain advantage that headaches are upon the whole more frequent amongst those who can afford to pay than those who cannot, because the excessive strain upon the eyes is more common amongst those who give up time to reading and so on than amongst those who are engaged upon bodily occupations. How are you to take it? If any of you suffer from headaches which attack you in the morning so that when you get up you have a dull pain in the head which you know is going to get more and more severe

during the day, until at last, about four or five in the afternoon it gets unbearable, the thing is to take a dose of salicylate of soda and bromide of potassium just at the very time when you are conscious of the first appearance of the headache. You must not wait too long or it is no good, because in all headache there is a rest first of all of the secretion from the stomach and then apparently of absorption from the stomach. A man who is going to suffer from a sick headache if he takes breakfast and the headache does not come on till two hours after, will very likely vomit that breakfast about six or seven in the evening digested. If it come on immediately after breakfast he will vomit it undigested. If it comes on within a quarter of an hour after the secretion of gastric juice is stopped, the food lies in the stomach as it would in a bag and is brought up hours afterwards unaltered. If it does not begin till a couple of hours after the ingestion of food the food is digested, and is again brought up because it is not absorbed. If you can manage it, it is better to stop the headache before it begins; to stop it actually before any symptom is felt. In some cases men have some prodromata;

they know either by feeling themselves exceedingly well the day before or by feeling certain symptoms that they are going to have a headache next day. The symptoms that very frequently come on are, irritability of temper, which the patient himself recognises as unusual or else great drowsiness. Both are indications in many people of headaches coming on and if these are felt the night before it is well to let the patient have a dose of the salicylate of soda and bromide of potassium just as he goes to bed.

HOARSENESS.

A Clinical Lecture delivered by Sir T. Lauder Brunton F.R.S. at St. Bartholomew's Hospital on Friday, March 19th, 1900.

The subject I have chosen for a clinical Lecture to-day is that of hoarseness

Gentlemen:- You have a very good illustration of this Malady before you in the person of the Lecturer and we have another very good example of hoarseness in "Elizabeth" Ward, but the two cases ~~have~~ are due to entirely different pathological conditions. Many years ago a curse was laid upon the Pharisees. They were told "Ye say and do not" and they were cursed for doing so. Theirs was a moral depravity and the curse ~~that~~ was laid upon them was, ~~as~~ because they laid upon other people, a burden too heavy to be borne ~~and~~ while they would not touch ~~them~~ it with one of their little fingers. Now, there is another class of people in modern days who "say and do not" and that class of people is Doctors, ~~and~~ ~~the~~ a curse falls upon them also because they say and do not. They tell other people what they ought to do and they themselves go and do the very reverse. I know perfectly well that if a patient came to consult me for hoarseness instead of advising him to come & lecture to you as I am doing now I should say 'Now, my good Sir, what you have got to do is to go to bed and stay there and you must have the room kept at an ordinary steady temperature. It should vary from about 65° to 70° and you must see that it does not go down at any time in the 24 hours.' Frequently you will have brought to your bedside an inhaler. It is not necessary to have one specially made for the purpose, if you get a good deep jug and

fill this with water, the proper temperature of which is ensured by taking two parts of boiling and one part of cold. Into this you pour a teaspoonful of compound tincture of benzoin and you inhale the vapour for 5 minutes every two hours and if the hoarseness is very bad you may do it every hour, or in place of using the compound tincture of benzoin you may employ another vapour, viz: the vapor pini sylvestris, consisting of oil of Scotch Pine 5 minims, light carbonate of magnesium 4 grains, diffused in water to one fluid drachm and this is to be put into a pint of water, at 150°.' In addition to this you tell your patient to have a wet compress which is to be put over the neck and kept there and you feed him on light diet and above all things you will enjoin upon him perfect silence. That is what you tell other people to do; what you do yourself is just as I say the very opposite. The consequence of that is that the Doctor does get a curse upon him. He does not recover as quickly as the patient, who would be very well in a couple of days, whereas the doctor is not well for a week, perhaps longer. Sometimes you may get people in whom this condition goes on from bad to worse, and it will be months before they get well and finally they are obliged to follow the advice which they would give to a patient at first.

Why do people get hoarse? As a rule you may say that it is brought about because the vocal cords are not vibrating properly. This may be due to some pressure on the cords, in the cords or around the cords. If a little plug of mucus gets pushed down upon a cord, that cord will not vibrate freely and so the person is hoarse for the time being, but

when he gives a cough the mucus is dislodged and the hoarseness disappears. Instead, however, of its being simply a little plug of mucus that has lodged on the vocal cord it may be an alteration in the cord itself. The cord may have become thickened and congested and will not vibrate freely. In some cases the congestion may be along the whole length of the cord; in other cases it may be only in a part of the cord. Hoarseness, as you know, is a very common adjunct of a catarrh which frequently begins in the nose, travels down the pharynx to the larynx and then may travel further. It may go down to the bronchial tubes and there give rise to a regular bronchitis. Laryngeal catarrh is the commonest cause of hoarseness. In such a case you not unfrequently find on looking down into the larynx that the vocal cords are more or less congested throughout the whole extent in place of the pearly whiteness that the vocal cordsought to exhibit they are slightly reddened in colour, and sometimes you would be astonished to find how slight the redness is. It is really more a sort of greyish colour. That is the common form, but there is another form which is not so common, and for this reason I have thought it worth while to take it as a text for my lecture today. This is sometimes called laryngitis sicca. It is a most annoying condition because you get this hoarseness remaining almost permanently. The only difference is that although the voice is always hoarse it sometimes subsides into a whisper and the utmost efforts of the patient can hardly bring out an audible sound at all. Then all at once the effort is crowned with a kind of success and out comes a loud "squark" which the patient does not recognise as his own voice, and so between those whispers and

"squarks" the conversation is carried on. Now, in my own case there is not a particle of mucue will come up. I knew that there was a good deal of irritation in the larynx, but I knew that it was not the ordinary catarrh because generally after a cough or two some mucus is brought up, the voice is better and you feel relieved. But the irritating part about this kind of laryngitis is that nothing comes up and you cannot clear your voice, and every now and again one gets a most awful paroxysm of coughing so that you think you are going to die and yet after coughing in this violent way you are not a bit better than you were before. You have not brought up anything for the very good reason that there is nothing whatever to bring up. I have had my throat examined by a doctor. I was unable to do it myself because I had lost the apparatus. (Diagram shewn illustrating the condition) He found that instead of the whole of the cords being very red there was just a slight alteration in colour of the anterior third of the cords which is red and congested and just between the cords is a very slight ulceration. There is absolutely nothing to bring up, but this congestion of the anterior part of the cords and the slight ulceration, although it does not prevent the cords from being approximated, prevents them from vibrating freely while they are approximated. You can see therefore that the more you cough the worse you will be; that in the violent efforts of coughing the vocal cords are rubbed against one another, but for all that you cannot help coughing. Coughing, of course, is primarily intended as a reflex action for the bringing away of irritating things within the respiratory passages, but you cannot cough up a little ulcer and the more you cough the

worse it will become. I cannot quite tell you the reason why this is so. It is just possible I think that the anterior part of the larynx is much worse than the posterior because in a sort of hap-hazard way at intervals I have been trying to treat the larynx. I knew that I was not treating it in the way I should have liked but then I could not do so. What I wanted to do was to look into the larynx and with a sponge dipped in some astringent, say a weak solution of chloride of zinc, about one grain to the ounce I wished to sponge the vocal cords. Having lost my auto-laryngoscope I used vapours. I could not lie up because there was certain work I had to do. I could not use the hot vapours that I have just been recommending because I happened to be in placed where hot water was not obtainable. I therefore tried to use other kinds of vapours,and the one I show you is known as an atomizer. You put into it some form of liquid vaseline and as you see when you press the ball you blow out a cloud. Even the vaseline alone used in this way is useful to the larynx because it greases it. You know that whenever you have a catarrh anywhere and you put a little grease upon it it tends to ease it. If you have a catarrh in the nostrils by simply putting some zinc ointment on the end of your finger and introducing it well into each nostril, it allays the irritation to a great extent. In treating the throat, it is not necessary to use only the liquid vaseline. You may add to it various things that tend to stimulate the irritated portion of the mucous membrane and to induce healing. Amongst other things, menthol

seems to be a useful thing, and in the atomizer I am using I have about three per cent of menthol dissolved in paroleine. Paroleine is simply a liquid vaseline. You know that all those paraffins from solid paraffin down to petroleum oil vary very much in their specific gravity. Some are quite solid like the paraffin you use for embodying sections, and others again, like marsh gas, are permanently gaseous, and between these two are some that are liquid. This used to be called by all sorts of names, because several manufacturers obtained paraffins which were almost identical in composition and they gave these different names, but after a while they settled it among themselves and except paroleine nearly all have disappeared from the market. Another mode of treatment is with a nebulizer, which is used in somewhat the same way. These things are all very well, but what you really want to do is to paint the vocal cords and this you can do by means of the auto-laryngoscope. This instrument does not grow on every bush and if you happen to lose one, it is difficult to replace it. Probably you have never seen an auto-laryngoscope. I have seen very few, and the one I show you I bought in Vienna 26 years ago when I went there to study the use of the laryngoscope. It consists of a mirror in which is set a large lens; behind the mirror is placed a lamp or a candle and you can then see in the mirror a reflection of your mouth. You then introduce into your mouth an ordinary laryngeal mirror and with a little practice you will be able to hold your tongue down, and then you can see what is going on in your own larynx quite easily. When once you have learnt to do that the next thing is you must learn

to manipulate a brush with a bent handle, so as to be able to touch the larynx. This is the proper way of treating the affection, but failing this you must have recourse to the nebulizers or the atomizers. The condition, however, which is a rare one, is probably due to some extent to some gouty irritation, and it is advisable to put the patient upon some sort of treatment with citrate of potash or something of that sort. I believe that a good deal of irritation in the respiratory passages is frequently allied in its nature to eczema, and I rather think that what I have described to you is of this character. You may, however, get a irritation in the air passages altogether out of proportion to the amount of lesion in the air passages. I was once called to see a very gouty old man. He seemed as if he were going to tear himself in pieces. There is an old German fable about a man who is called R and he was to have received certain advantages from some person if this person failed to tell him his name. The person failed the first and second time and then succeeded at the third. R turned himself round and tore himself in two. The old gentleman I have referred to seemed to be going to do this sort of thing. He coughed and coughed until one thought he was going to tear himself in two. I thought the old man's life was not worth three days' purchase till I came to examine his chest, when to my astonishment, I found there was very little in it. Then I said "I think the old gentleman has got eczema inside. The old man agreed that he had formerly had it outside and that when it left there it seemed to go in and he got this cough. We then treated him practically

as a gouty man and gave him something for the cough and it got well, but no sooner was the cough well than out came the eczema. The old man said he would rather have it inside, so we treated the eczema outside and back came the cough. He then said he would rather have the eczema again, but the second time we found it rather hard to get it out, the cough soon coming back. This is an unusual condition of laryngitis sicca but it is well that you should be able to recognize it; no expectoration, considerable croaky hoarseness, a vile cough and nothing to shew for it. Well you might say what good is all your medicine going to do unless you give the rest which is the great essential? Rest is the thing you enjoin upon your patiants whether you take it yourself or not.

As I said, we have another case of hoarseness in the Wards depending upon very different conditions. This patient, a woman, is very hoarse but if you look into her larynx you will not find merely a little redness and a little superficial abrasion but you will find a tremendous thickening and deep seated ulceration. In her case the epiglottis is thickened and rough and looks like a bit of cartilage, and then there is, what is very characteristic of laryngeal tuberculosis, thickening around the arytenoid cartilages. In the early stages of laryngeal tuberculosis the cartilages become swollen and they assume a curious pyriform look, smooth, glazed looking, but later on they become ulcerated and the vocal cords are difficult to see on account of the spores which extend over them, but so far as you can see the vocal cords themselves tend to be congested, to become ulcerated and clear up. Now, if you can get laryngeal tuberculosis at the very beginning you may sometimes find that just when the arytenoid cartilages are beginning to swell and when there

is a little ulcer formation between the arytenoid cartilages, if the patient can use the autolaryngoscope and paint the ulcer with lactic acid either every day or twice a day the ulcer may heal up and the patient may recover. But, as you can readily imagine, recoveries in those cases are few and far between, because there are not very many persons who can use the autolaryngoscope and perhaps still fewer who have the patience to go on with it day after day for a couple of years; so that practically the treatment of laryngeal tuberculosis comes to be symptomatic because the cases that come to you, like the one in the Wards, are so far gone when you see them that there is almost no chance of loing them much good. All that one can do is to lessen the irritation and this can to a certain extent be done by giving morphine and opium in some form, either of a linctus or of a jujube or of a lozenge. The opium lessens the irritability and lessens the cough. Of course, there is a disadvantage because patients suffering from tuberculosis as a rule have not very much appetite to start with and the things given to relieve the cough are very apt indeed to lessen the appetite still further, and yet it is a choice of evils, because if the cough be allowed to go on it causes venous congestion which affects the stomach and tends to induce loss of appetite, nausea, retching and vomiting. Therefore it is just possible that in some of those cases by the use of opiates you do more good than you do harm. The local use of opium is perhaps one of the best ways of giving relief and this is best used by means of an insufflator. There are three

forms of insufflator in ordinary use. One consists of a long tube over which is a small covering tube and to the end of this is fixed a piece of soft rubber and a mouthpiece. One plan is to put into the long tube a powder containing some morphine and some starch to give it bulk; 8 to 10 grains of morphine with 2 grains of starch make a very good powder. You then cover the opening and introducing the insufflator into the patient's mouth you watch for the moment the patient is taking a breath and blow the powder in. This is the simplest way, but I do not think that it is a method that is altogether free from risk. Some years ago a nobleman living in a healthy country house and away from anyone who had a phthysical tendency was suffering much from sore throat. He was treated by insufflation by the method I have just described and the person who blew the powder into his Lordship's throat was the country doctor. A year or two after the treatment began, the country doctor went out to Colorado for phthysis and died there and not very long afterwards his lordship developed phthysis in the lungs and he died likewise. It has always occurred to me that possibly in blowing the powders into his lordship's throat the doctor blew in some tubercle bacilli also. This risk of course, is avoided if in place of blowing into somebody else's lungs the powder is conveyed by pressing an india rubber ball. When you have a lot of cases to attend to it is easier to do it with an apparatus which blows out a very fine powder. In cases where you are dealing with laryngeal phthysis it is advisable to employ the treatment very frequently. I think I have told you the main points about these two distinct classes of hoarseness and I will proceed to take my own advice and not use my voice again for a couple of days.

My Lord, ladies and gentlemen:- The Report of the National League for Physical Education and Improvement is in your hands, but unless I am greatly mistaken most of you would like to learn something about its contents without the trouble of reading it, and you may ask, - very probably have asked - yourselves "What has the League been doing during the whole time, now nearly a year, which has elapsed since the meeting at the Mansion House. Many of you have no doubt watched large buildings being raised, and, if you have paid any attention to them, you will have noticed that it is a long time before anything appears above the surface, but after the foundations have been laid and after the walls begin to rise, the buildings grow with great rapidity, so much so that you are often astounded at the rate of their progress. The same is the case with Societies. A great deal of time has been required in order to lay the foundations of this National League deeply and widely. We have been trying to lay them deeply so as to include everything that is necessary for the health of the people, and we have been trying to lay them widely all over the country. (hear, hear). Naturally our progress has been slow, - we are just beginning to see something that we have done.

If you will look at this small booklet "The Health of the People" you will see that the objects of the Society embrace the whole health. We begin with the babies, and go on to the youths and take up the adults. We are trying to save the babies, to train the youths and to bring the adults into better condition. Now, it has appeared to us that one of the first ways of saving the babies and lessening the frightful infant mortality throughout the country was to pay attention to the milk supply. We have, consequently, had a

Milk Committee, which has been trying to gain information in regard to the best methods of supplying pure milk both to town and country, and if possible to draw up a scheme by which the best method could be applied all over the country. His Lordship has very truly said that our work is that of a confederating association and it is necessary to emphasize this fact because, notwithstanding all the explanations which have been given about the work of this Society, many people are still under the belief that it is a society for doing this, that or the other, but not for confederating other Societies. For example, I was talking to a gentleman who had been greatly interested in Boys' Clubs, and he said:- "Why does your League interfere with Associations for Boys' Clubs? Why do you not confine yourselves to the supply of milk.?" This was, of course, an entire misapprehension of the work of this League. We intend to gain information and we intend to bring all the various Societies into co-operation, but our Committee found, in dealing with the milk question, that, whereas some places had got very good schemes indeed for providing good milk, others were feeling their way blindly and not knowing how to set about the work. What we wished to do was to find out the best method and then instruct the home. We wish to bring all those Societies into relationship and that we should form the binding link between them. Nor is it only in regard to milk that we wish to do this. We desire to do it also in regard to a movement which has just begun, and which I am happy to say has been originated by the ladies, and that is the movement for the establishment of creches, places where children shall be taken care of in the absence of their mothers when these mothers are obliged to leave them in order to work. This movement is just beginning, but we trust that we shall be able to extend it throughout

the whole country taking care at the same time that the establishment of such creches shall in nowise interfere with the family life where such can be had, but shall only supply the want where the mother is unable to attend to the needs of her children. Then, again, in regard to the feeding of children the question seems almost to have been settled by the legislature that children shall be fed, but now are they to be fed? The legislature will take a great deal of trouble and time before it finds out the best ways of doing this, and in all probability a good deal of the feeding may have to be done by voluntary agencies. The work of our League is to find out how it can best be done, and to make people know how it is best to be done, to bring all the agencies for voluntary or compulsory feeding and for feeding by the mothers and fathers into relationship with one another at a cheaper rate than they could otherwise do, so as to secure the best feeding for the children throughout the country. In the same way the legislature seems to be making up its mind that the physical training of boys and girls is a useful thing: but how is it to be done? Here again it is the work of the League to find out the best systems that are used all over the world, to bring those into relationship, and, if necessary, to evolve still deeper ones and to have them taught to the teachers who shall teach the children throughout our country. But whenever we come to deal with any of those question, we are met with a difficulty: how are the babies to be looked after? how are the children to be fed? how are they to be trained? and what training can be given to them without doing harm to them. Here the only answer is, we must have medical inspections of schools, and this reply has been given by every Commission, by every Departmental Committee that has gone into the question (hear, hear). So that practically

if the Government is to follow the advice of those whom it has appointed and who have reported upon the subject, it is bound to have medical inspection. There are however difficulties. A Deputation that was sent by this League to meet Mr. Birrell had a very sympathetic reception, but he said there were practical difficulties in the way. He mentioned that one of the difficulties might be that he had not sufficient backing. If the League can so agitate throughout the country that Mr. Birrell has the necessary backing, then it will go, and we shall get medical inspection. We ought not to be behind other countries. Berlin sees the necessity of a medical inspection and it has rather more than doubled, I think nearly trebled, the number of medical officers engaged in inspecting schools, so that each officer has now from six to eight schools under his charge, and he has to inspect the children, not as formerly only when they entered, but all through their school life. The doctors are therefore able to watch the progress of the children, and if anything happens to the child during its school life to damage that child the cause of the damage can be removed. Now, this is a point that is of very great importance indeed, because it has occurred to me again and again to see boys from public schools who had had their hearts strained by over-exertion. If we are going to introduce compulsory physical training into schools we must be sure that no parents can bring against those schools the charge of having permanently damaged the child. (hear, hear.) Therefore we must I think have compulsory medical examination of schools (applause).

Boys want to be trained not only for their physical advantage but they want to be trained to keep them out of mischief, and there was founded in London some time ago a society which had this object in view. In fact I believe I

am not mistaken in saying that it was originally called the Anti-Hooligan League. It has, I believe, done an immense amount of service in London. I am glad to say now that it is becoming joined to the National League. Until we had our schemes ready for dealing with all the various problems before us, until we were able to show some definite method we could not form the branches we would like, but we have been doing a great deal of work in the country in this way, and although we have not yet been able to issue definite schemes of work we have been, at any rate, able to arouse enthusiasm to such an extent that already two branches of the League, newly formed exists in Bristol and Cambridge. All over the country, from west to east, and from south to the northern end of Scotland, we have people who are ready to found branches as soon as we can give them definite information as to how they are to begin and how they are to proceed. But although we find that men are willing to give both time and money there is still much to be desired in reference to the money. Englishmen are easily touched in their hearts by tales of distress, and we see how sympathetic they are from the amount of money they give to hospitals, but if you can engage heart and pocket at once you will be sure to carry whatever you want. I think it is very likely that many of the people who give funds to hospitals so largely never consider that although they are relieving distress it would be a very much better plan if the diseases which give rise to the necessity for hospital treatment could be avoided (hear, hear). This is what we shall be able to do by the various methods which we are trying to co-ordinate, and I think also that if we could show people that the loss of money which is caused by the loss of time is so great that if we carry all our schemes we

shall lessen the rates and taxes to a very much greater extent than could otherwise be done. I am glad to say that one gentleman, who is unfortunately since dead, had such an appreciation of the needs of this League that he gave us the generous donation of £250 - the late Mr. E. M. Denny. This is an example which we would like to see imitated all over the country and for this reason I propose to you that the Report should not only be filed at the Office but should be circulated all over the country in order to stimulate every one in the old words "Go thou and do likewise."

CANCER of the STOMACH. No 1

Clinical Lecture delivered at St. Bartholomew's Hospital, on Friday February 5th. 1897.

... wanted - Abdomen
open
with liver removed
under surface of liver

Diagram of stomach with numbers

CANCER of the STOMACH

Clinical Lecture delivered by Dr T. Lauder Brunton. F.R.S., on Friday February 5th 1897, at St. Bartholomew's Hospital.

Gentlemen:- We have had lately three cases of cancer of the stomach in the wards, and we have one at this present moment. The diagnosis in those three cases has been verified by post mortem examination. Just now, we are uncertain of the diagnosis in the case now in the wards, but the symptoms and signs presented by the man leave very little doubt that he also is suffering from cancer of the stomach. Now, cancer of the stomach is a disease that is very formidable, because when it once comes on there is very little chance, if any, of doing more for the patient than alleviating his symptoms and somewhat prolonging his life;— ~~but~~ cure is almost beyond hope.

Dyspepsia is a very common disease, and dyspepsia frequently depends only upon those functional disturbances of the stomach which are easily removed; Its cure depends ~~also, however,~~ upon the causes which have brought about those functional disorders of the stomach being discontinued; the most frequent causes being irregularities in meals, haste in mastication, ~~and~~ the consumption of food either too great in quantity, or wrong in quality, ~~or~~ and still more frequently, the abuse of stimulants, under which head I include not only alcoholic stimulants but tea and coffee, more especially tea. But if you have a patient with ~~case of~~ dyspepsia coming to you and complaining, as ~~a case~~ one came to me a short while ago, that he has been to see another doctor and that he consults you because the other doctor has lost interest in his case, then you may be pretty sure that the disease is serious. Practically, when a doctor is said to have lost interest in a case,

it means that he has tried everything he knows to cure the patient, and that in spite of everything the patient's disease continues. More especially are you doubtful of your ability to cure such a case if the man is over 40; because three-fourths of the cases of cancer of the stomach occur in patients who are over 40 years of age. In patients under this, you are always more or less hopeful, however grave the symptoms may appear, but in cases, especially of people over 50, where the dyspeptic symptoms come on in persons who have been previously well, and where they prove rebellious to treatment, you are always afraid that there must be some serious organic lesion behind the symptoms. / The first indication, then, that leads you to suspect that dyspepsia is the outcome of cancerous mischief in the stomach, is the age of the patient; the second is the rebelliousness of the symptoms to treatment. But if, in addition to this you find that the patient has been gradually losing weight, that his friends have remarked that his cheeks are not only thin, but that he is losing his complexion, his colour is becoming sallow, his lips pale, and he complains that he has lost his strength, and has lost his interest in things generally, the diagnosis becomes still more likely of malignant disease. If in addition you find that on examination of the abdomen you can feel a distinct tumour, then, your diagnosis is rendered almost certain.

Now, the position of the tumour varies naturally according to the part of the stomach affected, but it varies also with the position of the stomach at different times. It is perhaps easier instead of reading to you a list of numbers to show where the cancer is most likely to occur, just to draw a diagram. Cancer generally occurs at the pyloric orifice, the approximate numbers being about 60 per cent. In 60 per cent of the cases of cancer of the stomach, the seat of the disease

is at the pylorus; in about 11 it is in the lesser curvature, at the cardia in 8 per cent, at the fundus in 1, at the greater curvature in 3, at the anterior surface in 3, and then on the posterior surface in about 5. I indicate the posterior surface by a dotted line, instead of a full line. Naturally, then, the position of a tumour which you would feel, would vary according to the position in the stomach of the tumour; but even in cases where the pylorus is the part affected, you may find that the tumour varies in its position very much from day to day. You see here the position of the viscera upon this cast, which is a model made by His of Leipzig, and the companion cast shows the appearance of the abdominal wall. I will draw upon this cast the position of the liver and also the position of the stomach. You will see it corresponds roughly to the position of the viscera displayed by the removal of the anterior wall . I will remove from this cast the liver, so that you may see the natural position of the pylorus, and you will observe that in the healthy man, it is covered by a thin layer of liver, ~~and~~ ~~at~~ At the under surface of the liver you can see the little depression in which the pylorus lies. And it is rather ~~a thin layer of liver that covers the pylorus, so that~~ the pylorus really ought to be completely covered from palpation by a thin layer of liver.

And it would be only through this layer that a swelling of the pylorus could be discovered if it remained in its normal position. So that in a case where there ~~was~~ is a small swelling of the pylorus, you ~~want~~ ought to have it manifesting itself by a certain amount of resistance just at the junction of the right and left lobes of the liver. But although one might think that the pylorus was pretty well fixed by its attachments, it is not so, ~~because~~ and consequently you find that a pyloric tumour may be felt in very many different situations; ~~over~~ in the abdomen, sometimes passing down to the umbilicus or below it, ~~and~~ or passing almost under the left hypochondrium. Perhaps I cannot illustrate ~~that~~ this better

than by describing a case which was admitted into Rahere Ward on December 1st. It was that of James Howe, a warehouseman. The history is that he was well until May 1896. He was then attacked with profuse diarrhoea and pain at the umbilicus which was relieved upon pressure. He had indeed simply the signs of a severe colic. He passed no blood, he had no vomiting, and the signs at first appeared to indicate that it was the intestine and not the stomach that was involved. But from that time onward he began to feel pain after taking food, which gradually became worse. The pain came on about an hour after food, and although he had never vomited, he began to lose flesh very rapidly, and just before his admission he had become so weak that he fainted in the streets. When he was brought in he was practically healthy as regarded almost all his organs, with the exception of the stomach; but on examining the abdomen we found a hardish mass, which I have tried to represent in the diagram, and you will notice that the mass appeared to correspond to the body of the stomach. One could feel around what seemed to be the greater curvature, a distinct hardness and resistance, and between the upper margin of the hard mass and the ensiform cartilage there appeared to be a depression as if you could feel right over the smaller curvature of the stomach, and in this depression the beat of the aorta was very distinctly felt. On the first day, I was inclined to think that the patient was suffering from malignant disease of the stomach, but probably of a kind which had attacked not the pylorus simply, but had attacked the fundus and infiltrated the stomach to a great extent.

Now, perhaps before going on further with the symptoms, I should mention that Zeigler in his Pathology divides cancer of the stomach into five divisions, one of which, consisting of flat epithelial cells, attacks the cardiac end and is of comparatively little importance. The other four are solid

medullary, what he terms adenoid, medullary, schirrous and colloid. The form which is most likely to make a diffuse infiltration of the stomach is the colloid, but you may also have the medullary infiltrating the stomach. The schirrous is much more generally confined to the pyloric end; so that I thought that possibly this condition might be one of colloid. But it might not necessarily be so, because, although schirrous usually affects the pylorus, it may affect a considerable extent of the stomach, and you will see here the specimen of a stomach with thickening of its walls from the formation of schirrous (No. 1924 in the catalogue) If I hold this before the diagram, you will see that it corresponds very nearly to what the stomach appeared to be on the first day of examination. But in a case of this sort it is well not to make your diagnosis too certain from one examination, because the next day when we came to examine the stomach we found a different appearance . On December 3rd there was a mass close up under the liver. On December 5th it had altered again, and then it was in the left hypochondrium. On December 22nd it was different again; we had a mass under the right hypochondrium, but in addition to that there was a new development, another mass to the left which had not been noticed before. On January 5th a considerable amount of increase had taken place in the size of the tumour, and it seemed then that in addition to the mass in the right hypochondrium there were several other hardened masses more or less connected with it. In this case when the tumour was noticed on December 3rd to be in the right hypochondrium, it was felt to descend readily on respiration and such descent of an organ on respiration is very apt to show either that the organ which descends is the liver itself or is closely connected with the liver. The descent upon respiration might have appeared to indicate that this tumour was really a tumour in the liver; it descended so freely

with respiration and ascended when the diaphragm again went up during expiration, but what showed it not to be the liver was that it was freely moveable from side to side, and that even spontaneously it travelled away almost to the left hypochondrium; so that the diagnosis seemed to show that this tumour was more or less connected with the liver, as it descended during respiration, but that it was not a tumour of the liver inasmuch as it was moveable from side to side. Moreover, although on percussion the tumour was slightly dull, it had not by any means the absolute dulness which you find over an hepatic tumour.

In another case, that of Emma Jones we had a tumour which descended very much lower, and in neither of these cases was there any great enlargement of the stomach. In the case of Emma Jones, there was a mass which could be felt as low down as the umbilicus under ordinary circumstances and descended a good deal below the umbilicus when the stomach was distended by making the patient swallow first some bi-carbonate of soda and afterwards some citric acid, so as to evolve a quantity of carbonic acid in the stomach and distend the organ. In both of those cases we had a distinct tumour without any great enlargement. In the case of Howe the reason why two very constant symptoms of pyloric cancer were absent was clearly explained by the results of post mortem examination. In him we had pain, wasting, and gradual weakness, but we had not either vomiting or distension of the stomach - both of which are usually marked symptoms in cases of pyloric cancer. When, however, the stomach came to be examined, it was found that although the whole of the pylorus was converted into a cancerous mass, yet the opening of the pylorus was sufficiently large to admit the finger of the pathologist, covered as it usually is with a somewhat thick india-rubber glove, passed through the orifice. There was, however, no contraction of the pyloric orifice in spite of the cancer. The post-mortem examination reads as follows:-

Stomach somewhat enlarged, but not greatly, and at the pyloric end a mass of new growth about the size of a cricket ball and consisting of the whole of the pylorus but not extending far into the stomach, and evidently not at all into the duodenum. The pyloric orifice admitted a gloved fore-finger; the surface of the mucous membrane was very lumpy and was here and there superficially ulcerated. There was no blood in the stomach or intestine. In some other cases, however, we find that dilatation of the stomach is a very marked symptom indeed.

This was shown in another case, that of Mr Wertheim. He was a poor curate, and the doctor who was in attendance upon him asked me to see him at my house as a gratis patient. I saw him on October 14th, and then I found that the stomach was greatly dilated, passing down nearly to the umbilicus. I have drawn this stomach upon the cast, so that you may be able to compare better the size of the stomach with the normal organ. To get a stomach extending down to the umbilicus, it must be very greatly enlarged indeed. Here you see an example of a stomach dilated, and dilated mind even to a greater extent than we found in Mr Wertheim's case. This specimen, which you have before you shows a dilated stomach due to malignant stricture of the pylorus, and containing no less than ten pints. Now, this case of Mr Wertheim leads one to consider the onset of malignant disease of the stomach. In some cases it comes on quite quickly, as in Howe's case, where a month or two before his death he had been perfectly well, and then he developed all the symptoms of colic, and from that day he went on getting steadily worse and worse until he died. But in other cases, instead of coming on quickly, it comes on slowly. This gentleman had been suffering from symptoms of dyspepsia for a length of time. His age was 41, and his stomach had been a trouble to him more or less ever since the age of 20. At that time he had excessively severe pain in the stomach. On examining the

abdomen I was quite unable to feel any mass whatever, and, on account of the absence of any distinct tumour, I came to the conclusion that he had got dilated stomach due to contraction of the pylorus, but that the contraction of the pylorus was probably not malignant, but was due to the contraction of old cicatrices of ulcers from which he had suffered 20 years before. Perhaps I was influenced in this diagnosis by the fact that about nine years ago I saw a private patient who presented all the symptoms, as I thought, of malignant disease of the stomach, and more especially of pyloric disease with great dilatation of the stomach. I treated him by washing the stomach out, and he improved so rapidly under this that I began to reconsider my diagnosis, and concluded that I had been mistaken A second time, however, the symptoms came on, and no treatment was of any avail. The poor man died, and then on post mortem examination we found that, although there was great stenosis of the pylorus, there was no malignant disease. The pylorus was so small that we could barely get a probe to pass through it, but it was perfectly healthy in-so-far that there was no trace of malignant disease, and the contraction was simply due to the contraction of the cicatrices of old ulcers. I, therefore, thought that in Mr Wertheim's case we had probably to do with a condition of the same sort, but he went on getting steadily worse and worse in spite of all treatment, and as he was very poor, I could not get at his home any of the things that he required, suitable to his case, I took him into the hospital. He then developed vomiting to an extraordinary extent. We had tried to feed him by the bowel, but in spite of all that we could give him, either by the stomach or the bowel, he gradually lost strength, and a resistance was felt and, more or less, afterwards there was a certain indication of a tumour just at the right hypochondrium. This made me fear that he was suffering, not as I had diagnosed at first from a simple contraction of the pylorus, but from a malignant -

contraction, and the loss of strength made me unwilling to recommend any operation. When I had first seen him, however, and diagnosed a simple contraction, I had mentioned to him that an operation might possibly relieve, or completely cure him, and when he came into the hospital he harped very much upon the operation, and finally, although I did not think it was a case suitable for it, he was transferred to Mr Butlin and the operation was performed, but unfortunately the poor man sank that same night.

There is a great deal more to be said on the subject, but time presses so that I must defer further remarks until another lecture, when I shall deal with some more points about the diagnosis and treatment of the gastric ulcer, especially the operative treatment.

C A N C E R   O F   T H E   S T O M A C H . No 2

Clinical Lecture delivered March 12th,1897.

CANCER OF THE STOMACH.

Clinical Lecture delivered by Dr. T. Lauder Brunton, F.R.S., on Friday, March 12th., 1897 at St. Bartholomew's Hospital.

Gentlemen:-, Since we last met two things have occurred, and two statements that I made to you at the last lecture have been confirmed. The first statement was that if a patient suffering from dyspepsia comes to you saying that his doctor has lost all interest in his case, the case is likely to be a serious one, because such a statement means that the doctor has tried all the ordinary remedies for dyspepsia and has failed to effect a cure. Such a condition of things usually implies that the disease from which the patient is suffering is not purely functional but is due to some serious organic change. I mentioned to you that a patient had come to me some time ago making this complaint and I feared the prognosis was a grave one. Since we met he has come up to London in order to have an operation performed upon his stomach, but before the operation was undertaken he began to show signs of jaundice, the tumour in the abdomen began rapidly to enlarge, and it was thought inadvisable to perform the operation, and he sank gradually in spite

of all efforts to maintain his strength by feeding him either by the mouth or by the rectum. The other statement that I made to you was, that a patient in "Rahere" Ward presented a tumour in the epigastrium which we thought was likely to be malignant, but at that time the diagnosis had not been confirmed. In the other cases the diagnosis had been confirmed by post mortem examination, and in this instance the diagnosis has been confirmed by opening the abdomen and finding a malignant tumour there. Fortunately, the operation has been so far successful, and although the patient cannot expect any very prolonged tenure of life, yet he is somewhat relieved of his symptoms, as you will see in a short time. Before entering however, upon the operation and showing you in this patient the consequences of it, I wish to follow up what I said at the end of last lecture in connection with poor Mr Wertheim's case regarding the progress of cancer in the stomach. I mentioned one case in which it had come on and proved fatal within the course of a few months, but I observed that, notwithstanding the statement of such a distinguished authority as Ewald, that cancer in the stomach frequently comes on, perhaps generally comes on, without previous symptoms, yet in a large number of cases you find that cancer of the stomach is preceded by symptoms of dyspepsia for a considerable number of years, as it was in Mr Wertheim's case.

We must assume in some cases either that the duration of cancer of the stomach is much longer than is usually supposed or else that cancer may begin to grow in a stomach already diseased and more especially may infiltrate an old ulcer.

There seems to be little doubt from post mortem examinations that the latter is the case, and that you do get cancer attacking and infiltrating old ulcers. Now, the case that I wish to draw your attention to to-day is one that occurred in my practice several years ago. This was a man, aged 62, who came to me on November 29th 1886, complaining that he had been losing flesh. He had always been liable to bilious attacks and he had been suffering from pain and nausea from one to three hours after meals for several months. For two years before I saw him, that is to say in 1884, he began to suffer from sickness at intervals, and for six months before he consulted me, the sickness had been almost continuous. He had been suffering from great flatulence for twenty months and had brought up coffee ground matter. He had also been suffering from rather intense pain. In consequence of these symptoms, I wrote to the doctor my diagnosis as follows:- "From the history which the patient, or rather his wife, gave of the intense pain which he suffered in September," that was about a month before I had seen him, "and of his vomiting coffee coloured matter, it seems probable

"that he has had ulceration of the stomach and very probably, I think, it may have been simple ulcer. " My diagnosis of the simple ulceration was based chiefly upon the fact that the pain from which he suffered had been very intense, and upon the fact that the symptoms had lasted for two years without his being very greatly pulled down by them. As a rule, the pain that you get in gastric ulcer is very much more acute and sharp than you get in cancer. In cancer the pain is more dull, heavy, and is less connected with the administration of food; in gastric ulcer the pain is generally sharp and severe and is more usually connected with the administration of food; coming on in cases where the ulcer is in the stomach either shortly after food, or perhaps some little time after food and lasting until the food leaves the stomach, or else, if the ulcer be presented in the duodenum, it comes on about three hours after food, just at the time that the acid contents of the stomach are leaving that organ and passing through the pylorus into the duodenum.

You have noticed in your physiological studies that one of the sharpest stimuli that can be applied to the skin of a frog's toe is a little acid, and if you have got a bad tooth you can soon recognise that what holds good in the case of the frog holds good also for man; namely, that acid applied to a bare

nerve as in the case of a carious tooth causes sharp pain. You notice the same in a cut in the skin. If you put into a cut or a scratch a little acid it causes intense sharp pain. If you put in caustic potash it will also cause pain, but the pains are quite of different character, not sharp and acute, but dull, heavy, burning and severe. In this case then, I diagnosed the presence of ulcer, but I concluded it was probably, from the continuance of the symptoms, and from the sharpness of the pain, due to a simple ulcer and not to a malignant ulcer. I heard from the doctor some time afterwards that the patient was very much improved, but I never saw him again. About five years afterwards, however, his case came into the Lancet in a curious way. The man had fallen down upon the pavement and died shortly afterwards, with coffee ground vomiting. He had been insured in an Accident Company and a claim was brought against this Company for Insurance. They disputed the claim on the ground that he had not died from accident, but had died from disease, and post mortem examination showed that he had malignant disease involving the pylorus. So that he had gone on for five years after I saw him, and although he did not die of the accident, but of the disease, his death was no doubt accelerated by the accident.

In such a case as this we must either suppose that the malignant disease in the stomach had existed for several years before death and had been of very slow growth, or else, that at the time I saw him he was suffering from a simple ulceration which afterwards took on a malignant character. Of course, this is a point which we cannot now decide, but I am inclined to think it more probable that when I saw him he had simply simple ulcer and that this afterwards became converted into malignant ulcer.

Another case which I wish to mention to you, as shewing that the symptoms of dyspepsia may last for a very long time, is one in which I examined the stomach of the patient, J.H.G., in the Autumn of 1887. He had been then suffering from flatulence for four years. He had a very good appetite, but he had a raw feeling in the epigastrium and the stomach was then distinctly enlarged. I give you a diagram of the shape of the stomach and you will see it shows a considerable increase in the normal size. He continued to suffer from symptoms of dyspepsia but without any tumour being felt in the stomach, until the middle of last year. In June last the stomach had considerably enlarged and a tumour could then be felt in the position indicated in the diagram. From these signs it was quite clear that the patient was then suffering from dilatation of the

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stomach with a swelling at the pylorus which was obstructing the pylorus and as possibly this might be malignant, and possibly it might not, I was inclined to hope from the long continuance of the symptoms, dating as they did from 1883, that is to say 13 years, that this tumour might simply be fibrous and not of a malignant character. I advised gastro-enterostomy, but the operation from one cause or another was delayed rather too long, the patient's strength began to flag in spite of everything that one could do, and when the operation was at last performed I am sorry to say that he sank rapidly under it. As a contrast to these two cases I will now give you another, that of H.J.H. whose age was 38. At school he suffered from very severe pains in the abdomen, so severe that he was obliged frequently to leave school and leave the playground and go and lie down on his bed. The people about thought that he was shamming, but a boy does not leave the playground and go to lie down on his bed as a way of shamming, as a rule. He suffered more or less from dyspepsia and on May 29 1895, I found that he had got a considerably enlarged stomach, very much the same as I have shewn in the diagram, the lower margin coming down close to the umbilicus. This I thought was probably due to contraction

of the pylorus from the cicatrisation of old ulcers and my diagnosis was that the pains from which he suffered at school were due to ulcer of the stomach, and that these ulcers having healed had left cicatrices, the fibrous tissue of which had so far contracted as to narrow the pylorus and lead to dilatation. I advised that he should have the stomach washed out daily and that he should have massage applied to the abdomen; also that he should take his solids and liquids separately; not take solids and liquids together at a meal but take all his liquids about an hour before a meal or else three hours after. On January 11th, 1896 I saw him again and the stomach was much as before, but when I passed the stomach tube in and washed his stomach out, I got out a fluid large in quantity, amounting to about a pint or more, of a dark claret colour with numerous flakes in it, and on examination I found that this was due to blood. This made me think that my first diagnosis had been wrong, and that probably I had to deal here not with simple fibrous contraction of the pylorus, but with malignant disease, and I advised that gastro-enterostomy should be performed at once; Well, it was found when the operation was done that there was a distinct thickening at the pylorus. It was not such a thickening as you could readily feel through the abdominal walls

and through the thin layer of liver which normally lies over the pylorus, but still it was quite a distinct thickening. The appearance was as shown in diagram, somewhat like a fowl's gizzard. The nature of this thickening we do not know now because we did not make an incision into it, and take a little slice out for microscopic purposes. I told the story of this operation to a foreigner, and he seemed a little astonished that we had not done so, but neither the surgeon nor I thought it would conduce at all to the patient's advantage to make an incision into the tumour for the mere purpose of obtaining a more accurate diagnosis. We do not know what the character of the tumour was, because immediately after the operation the man began to get well, and the same afternoon he was reading the "Strand" Magazine. He never had an ache or a rise of temperature or any bad symptom whatever, and the last I heard of him was that he was perfectly strong, eating anything and driving about in his buggy the greater part of the day, had laid on flesh and was practically a perfectly sound man. In this case then the operation was quite successful, although washing out was not successful.

In another case the operation was not even necessary. G.G., a solicitor, was seen on July 20th., 1896. He had sickness,

could take no solid food, and pain came on after violent vomiting. Thirteen years ago he had had a worse attack even than now. The stomach was considerably dilated and was protuberant over the pylorus. Here again I was unable to form any other diagnosis than that the man had dilatation of the stomach consequent upon a tumour at the pylorus, but the nature of this tumour I was unable to decide. I advised that the stomach should be washed out with hot water, and after this was done that he should take ten grains of sulpho-carbolate of soda dissolved in water in order to destroy any germs that might be present in the stomach. I should say that I saw him again six months afterwards and he had been going on well, but he had sickness again and the liquid that he brought up was streaked with blood. I advised him to continue the treatment notwithstanding and did not advise an operation at the time. I heard from his doctor a few days ago that this patient had been going on with the washing out and with the sulpho-carbolate of soda, and was now nearly well; so that probably in his case it was simply fibrous contraction of the pylorus.

Another case which may be of some interest was the first in which the operation of gastro-enterostomy was done in any

of my patients. This was I.A., a solicitor, an American, aged 43. In 1874 when in Paris he was seized with a sudden violent pain in the epigastrium. He vomited then a lot of blackish stuff. He went on till 1876 when he brought up a large quantity of blood, and in 1878 he was again attacked with pain. In 1879 he again had a sudden attack and he then apparently got an abscess formed in the abdomen which had burst at the navel, discharging a large quantity of pus. When I saw him his stomach was much dilated, but there was no distinct tumour. The intestines, however, were enormously dilated and matted together; so that the whole abdomen was exceedingly protuberant and was quite tense, and instead of the ordinary elastic feeling on manipulation it had a tense doughy feeling. My diagnosis was that he had probably had an abscess starting from close to the pylorus and that this had swollen, giving rise to limited peritonitis, and had finally burst at the umbilicus leading to matting of the intestines. I was at first inclined to believe, from the history of the case, that the abscess had started from the gall duct or gall bladder, because the patient gave me an account of pains coming on very suddenly, lasting a short time, and quickly passing away, and not having any direct connection with food. He carefully abstained from telling me

that he had brought up any blood. Afterwards, while in London, he had an attack of haematemesis and then he told me about the previous attacks. I then changed my diagnosis and concluded that the abscess had started from an ulcer in the stomach and not from any ulceration in the gall duct or gall bladder. I advised him, as medicines were of no use, to have an operation performed, and the operation that I thought would be most useful was to have the stomach connected to the ilium and have such adhesions as were met with freed at the same time. He declined to have any operation. He went away first of all to Germany where he was in a clinique under the care of a Professor who was a specialist in diseases of digestion, but there he began to get much worse. He then went to Cairo, thinking that the warm air would do him good, but he did not improve, so he came back to Vienna and saw a Professor, also a specialist in diseases of digestion, who treated him by washing out the stomach but in vain. He then went to Professor Billroth who said "I will cure you". Billroth opened the abdomen, made an opening in the stomach, pushed his finger in, and found that the pylorus was very tightly contracted. He then made an opening in the duodenum, connected the opening in the stomach with that

in the duodenum, sewed the patient up and he got perfectly well. Billroth's diagnosis and notes upon the case are so interesting that I think it well to give them in his own words as follows:-

> "Ulcus pylori cum cicatrice callosa permagna. Macies horribiles 41 Kilo. Gastroenterosteomia, Methode von Hacker. Resorptis tumoris callosi spontanea. Salvatio."

And it has been salvation because the last I heard of this patient is that he was quite well. I may mention, with regard to Von Hacker's Method which Billroth employed, that the case I have just quoted was the third one he had treated by this method. It consisted of making an opening on the under side of the pyloric part of the stomach about three or four inches from the pylorus and another in the transverse part of the duodenum and drawing the duodenum up and uniting these two - the stomach and the duodenum - so that the intestine was really shortened only by about six inches.

We will now pass to the case that I mentioned to you at our last meeting as being then in the Wards. This patient, James Perry, was admitted into "Rahere" Ward on February 3rd. He had been suffering from pain in the stomach, sickness and constipation. This is another of the acute cases. His pain began in the abdomen only about six months ago. Three months before admission he began to get sickness immediately after his food.

When admitted the stomach was dilated and a hard lump was found under the left hypochondrium. This lump was not general in its position, but, like the tumours in some of the other cases mentioned at last lecture, it varied in position and although it was under the right hypochondrium on the fourth of February, on the fifth it was a good bit further down, taking the position that I have marked in the diagram; on the sixth day it occupied a position much lower down. We kept him in a fortnight and as there was no advantage to be gained by simply the waiting ~~being~~ in, I asked Mr Butlin to see him with a view to operation. Mr Butlin kindly took him into "Sitwell" Ward on the 17th February and on the 22nd. as the patient decided to have an operation performed, he was taken to the New Theatre and anaesthetized. Mr Butlin, assisted by Mr Lockwood, then performed gastro-enterostomy. An incision was made an inch and a quarter in length in a vertical direction to the left of the umbilicus and about an inch above the level of the umbilicus and extending upwards. It went straight into the sheath of the rectus muscle, which was opened and the muscle was pushed onwards. The parietes were severed down to and including the peritonaeum, the bleeding points being secured. When the abdomen had thus been laid open the wound was enlarged upwards to the extent of threequarters of an inch. The stomach

was found to be pushed backwards by the enormous growth of malignant disease. There was a large infiltration of the mesentery with secondary nodules, very much in the same way as occurred in one case that I mentioned to you as having been verified by post mortem examination. The intestine was drawn out of the abdomen, two pieces of indiarubber tube were fastened round the gut at an interval of two inches, the contents having first been pressed out. A longitudinal incision three quarters of an inch long was made in the gut and the smaller of Murphy's buttons was introduced through the incision, one of the rubber ligatures of the gut being grasped by Mr Lockwood to give more room. The button was fixed to the intestine by a silk thread passed round through the wall of the intestine and the two ends were tied tightly and the anterior surface of the stomach was brought out. An incision one inch in length was made; the tension was great owing to the adhesions of the growth keeping it back. A second button was inserted, tied as in the previous button. The two parts were brought together, the abdomen was closed, the operation lasted thirty-three minutes. The patient vomited eight ounces afterwards, there was no rise of temperature, and he was fed by the bowel. Practically he has gone on very fairly well. He is not quite comfortable, but we cannot expect him to

be so, because, as you know, the operation here is only palliative. We did not expect to get a cure because we knew beforehand that it was a case of malignant disease which could not be removed, and all that could be done was simply to ameliorate the patient's condition. In other cases one has found that great amelioration has been obtained by such an operation and that life has been considerably prolonged. (Patient brought in)

You see here the situation of the wound. I do not know that you will be able to distinguish the mass, but there is to be felt a swelling, hard and resistant. The incision is just about the left end of the swelling. I ask the patient whether he feels pain when I press with my hand, and he says he does not. You see the operation has certainly been a source of considerable relief to him, and in cases where the tumour is purely fibrous then you not only get relief, but you get complete cure. The patients apparently go on for years. How long Mr A., whom I spoke of, will go on I do not know, but he seems now to be perfectly well, and so does the other one who was operated on about a year ago. Mr A. was the one upon whom Professor Billroth operated, and his life seems to have been greatly prolonged, and probably he will live on to a good old age; there seems to be no reason why one should not.

There is one thing to be said that in another private case where an operation was performed the man remained perfectly well for a whole year after the operation, and then he began to show symptoms of pyloric contraction again. The reason apparently was that the opening between the stomach and the duodenum had not been made sufficiently large and it was beginning to contract, and so he was developing again symptoms of pyloric stenosis. So that it is advisable if the patient is sufficiently strong to stand it, to make a good wide opening between the stomach and the duodenum. In cases where the patients are not very strong, they cannot stand it and Murphy's button must be employed, but if the patient is pretty strong it is probably better not to use Murphy's button, but simply to sew the edges of the wound together and thus you get a much larger opening and do not run the risk of this secondary contraction.

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Dilated Stomach - Gallstones

~~ABDOMINAL DISEASE.~~

Clinical lecture, delivered by Sir T. Lauder Brunton, M.D.,F.R.S., at St. Bartholomew's Hospital, on Friday, July 11th 1902.

Gentlemen:- We have had in the Wards several cases of abdominal tumour, and some of these have been of a malignant nature. For a long time I was inclined to think that the statements regarding the increased frequency of cancer were not due to any increase in the frequency of the disease really but only to the increased power of diagnosis which we now possess. No doubt a good deal of the apparent increased frequency of cancer is due to more accurate diagnosis, for I have come across a good many cases of abdominal disease which would probably formerly have been put down simply to chronic diarrhoea or intussusception, or something of that sort, which one knows now perfectly certainly to have been due to abdominal cancer.

Before proceeding to a consideration of cases I would mention that the diagnosis of abdominal tumours generally is of great difficulty. So great is the difficulty and so uncertain is the diagnosis that one of our greatest authorities on the subject, Sir Frederick Treves, has put it very truly in

one sentence "Whenever you open the abdomen expect the unexpected", and this is so very true that very often when one comes to a diagnosis which satisfies oneself and which seems, a priori, to be true you find that there has been a mistake either in the whole or in part when the abdomen is opened. The first instance that I wish to bring before you is somewhat of this kind. It was Albert F. a commercial traveller, aged 30, who was admitted into Rahere Ward on February 17th of this year. As a commercial traveller his meals had been uncertain and he was accustomed to take a good deal of alcohol. After a year or two of this he began to suffer from indigestion and four years ago he had pain after all his meals accompanied by vomiting. Three years ago he was admitted into the Hospital and was treated for eight weeks by lavage; his stomach was washed out regularly. He improved somewhat and was sent to Swanley, but as the improvement was only partial it was thought advisable to have him treated surgically. Accordingly, Mr. Walsham took him over and dilated the pylorus. This did not seem to give him as much relief as was expected and he came back to the hospital again with the same symptoms. On examination the stomach was found to be dilated. Now, in estimating the question of dilatation of the stomach, it is absolutely necessary to distend the stomach with gas as,

otherwise, you are likely to make a grievous mistake. In many cases where I have percussed the stomach out without previously distending it with gas I have thought the stomach was not dilated, but, when the patient took an effervescing draught so as to dilate the stomach with carbonic acid, the dilatation which actually existed in the organ became perfectly evident. We generally do it here by giving them an effervescing draught in two parts; first the bicarbonate of soda and afterwards some citric acid, but a little effervescing water such as soda water, potash water or apollinaris when taken into the stomach in quantities of about half a tumbler or so is as a rule quite sufficient to distend the stomach, unless the case is an out of the way one. Moreover, the patient generally likes this rather better than the effervescing draught taken in two parts.

Now, when you come to consider the size of the stomach upon a diagram, the apparent position and size vary a good deal according as it is a man or a woman. With a man the lower margin of the stomach usually comes about halfway between the xiphoid cartilage and the umbilicus, but in a woman it is different, the lower margin of the stomach usually reaches the umbilicus; the difference in the apparent size being due to the greater width in the man's abdomen compared with that of

a woman; the pressure of the stays elongates the chest of the woman and presses the stomach further down, so that the lower margin, as I have said, comes to be on a level with the umbilicus, instead of a good deal above it, and of course unless you know this, you may make a considerable mistake in regard to man and woman's stomach. I speak on this point with very considerable confidence, because I have made the observation in many hundred cases, and I find that it is almost an invariable rule that the stomach comes down to the umbilicus in a woman. If you find in a man that the stomach comes down to the umbilicus, then you may be pretty sure that the stomach is a good deal dilated and if you find that it comes considerably below the umbilicus than it is very much dilated. In Albert F. the stomach reached a good deal below the umbilicus and the rectus muscle on the right side was very rigid, so that it was difficult to be quite certain of the position of any tumour, but there was a swelling just under the ribs on the right side and over the position of the pylorus, and although this might have been due to the upper belly rectus, yet it seemed on palpation to be further in and to be really connected with the stomach. On account of these physical signs, and on account of the symptoms, he was handed over to Mr. Cripps, who performed gastric duodenostomy upon him. Unfortunately, although the

operation was successful at first yet peritonitis set in without any apparent cause and the man died in a few days. The we found not what we expected. What we expected to find was the stomach greatly dilated with a thick pylorus through which you could probably not pass anything more than a quarter of an inch in diameter, but at the post mortem the stomach was not found to be dilated and the pylorus would admit the thumb to be passed through it. This looks as if the diagnosis was quite mistaken, but I have no doubt that during life the condition was different because the signs were so well marked that we could not be mistaken as to the size of the man's stomach and the apparent want of dilatation was due no doubt to the contraction which had occurred after the operation. Relief of pressure had allowed the stomach to contract, so that it appeared on the post mortem examination to be of the normal size.

Now, the usual causes of dilated stomach we may say are threefold. One is atony, weakness of the stomach, and atony of the stomach itself is very often connected with a spasmodic condition of the pyloric end. Such a condition will occur normally in people who suffer from headache, during the occurrence

of the sick headache, and probably this condition of the stomach is the cause of the violent vomiting which occurs, or, at least, has got something to do with it, towards the end of the headache and accounts for the fact that during the headache there is generally little or no absorption of the food that has been put into the stomach. Another cause is contractio of the pylorus, and this is the most common cause. This may be due either to malignant disease or to cicatricial contraction of old ulcers. In one case I have seen the pylorus so far contracted by old cicatrices that it was impossible to pass even a probe through it. This was before the days of gastro-enterostomy or the man's life might have been completely saved by operation. The diagnosis in Albert F's case was that it was the contraction of the pylorus, probably simple and not malignant, and the reason why this diagnosis was arrived at was that, first of all, the length of time which had elapsed between his first illness and the time of the operation and, secondly, the fact that free hydrochloric acid was not found in the contents of the stomach when it was examined. The absence of free hydrochloric acid does not allow you to make a positive diagnosis of the presence of malignant disease,

but the presence of hydrochloric acid generally enables you to say with a pretty large amount of certainty that malignant disease is absent. Another cause of dilated stomach,or apparently dilated stomach, may be a drag upon the stomach by the omentum becoming adherent down in the iliac fossa from old appendicitis, or it may have been dragged down there in consequence of an operation for appendicitis. I saw a case of this sort several months ago and I diagnosed that the dilatation of the stomach in this man was due to a drag upon the stomach by an adhesion in the iliac fossa because the stomach instead of its lower border forming a pretty even sweep with its lowest point in the middle line of the body, it came unevenly; so that the lowest point was two or three inches to the right of the umbilicus. That looked then as if the stomach were dragged down by some influence which was dragging it towards the right iliac fossa. I wrote this to the gentleman's doctor and sometime afterwards the man was operated upon again and the omentum was found to be adherent in the scar of the old wound which had been made for appendicitis. The omentum was free and when I saw the patient again two months afterwards the stomach had returned almost to its normal size.

The next case that we have had is that of J.A.L., a gardener who came in with an abdominal tumour. On January 25th of this year he had pain in both legs going down to the ankles and it only occurred on movement. This is the sort of thing that one would have probably said to be a condition of rheumatism. He stopped a few days in bed; then he got pain in the abdomen and distension with wind. He had an irregular fever in February but this went off in March. There was no constipation, no diarrhoea, no interference with the functions of the intestine excepting the distension by wind. On May 12th he began to have fever again and this continued all the time until he left the hospital. The temperature went up frequently to 101.2 or even higher; one one occasion it went up as far as 103.6. He was very thin and the tumour was of a somewhat unusual appearance The stomach was quite resonant and apparently near its normal size, but down below it, very nearly in the course of the colon, was an irregular tumour, the appearance of which I show in the diagram. This was very hard. It was not tender. I felt uncertain as to the nature of it because as it occupied the position of the colon it was just possible that it might be a mass of faecal matter. In order to ascertain whether this

were so or not he had castor oil and his bowels were washed out with large enemota. This altered the appearance of the tumour because it seemed to clear up a little bit towards the right. It cleared away as if a good deal of matter had been released from the ascending colon, but on the other hand it grew larger in the centre and harder. This seemed to show that something new was growing. It was quite clear from the temperature that there was chronic peritonitis, but the cause of the chronic peritonitis was not quite so clear. It might have been tubercular or it might have been due to malignant disease. I cannot say with positive certainty now which it was, but a small subcutaneous nodule began to make its appearance before he left the hospital. This I think, makes it most probable that the tumour that we felt was of a malignant character, probably I should think a sarcoma chiefly growing in the omentum, and the man's death very shortly after he left the hospital, I think confirms this, because had he tubercle I think he would have lived for a longer time than two or three weeks after he left the hospital.

Just yesterday I saw an operation upon a lady whose case had reminded me somewhat of J.A.L's in-so-far that the stomach

in her case was also quite clear and resonant and not encroached upon by the tumour, but the tumour filled up the whole of the lower part of the abdomen; it seemed to have a sort of indefinite edge towards the left, close to the sigmoid flexure. She was said to have suffered from gall stone and she had an attack of rather severe pain in the right iliac fossa. When I saw her there was more tenderness and more resistance and hardness in the right iliac fossa than at any other point, but excepting that and the great distension of the abdomen the patient seemed in very fair health. What struck one was this, that the abdomen was distended but not apparently with gas. Instead of being resonant all over it was resonant only over the region of the stomach and the whole of the other part was dull, but the dulness did not fluctuate, did not move with the position as it would have done had it been due to free fuid in the abdomen; it remained steady. There was no definite fluctuation at all to be felt on palpation and when I first saw her the absence of any urgent symptom and the curious position of the dulness made me wonder whether it could possibly have been due to an enormous amount of fat in the omentum, because the lady was excessively stout. I saw her again a month later. There

was no change in the symptoms; she had remained very fairly well, but the abdomen was certainly more distended and on palpation one could feel a distinct fluctuation. I came to the conclusion that there was a cyst and I thought it was probably ovarian. Another consultant saw the case at the same time and he also agreed that it was a cyst but probably pancreatic. I believe there could have been a pancreatic cyst nearly large enough to account for these symptoms but I have never seen such a big one and, moreover, it seemed to me that the pancreatic cyst would not have come down so far, and that one could account for the pain in the right iliac fossa by a kink. The operation was done and a very large cyst indeed was removed. It was an ovarian cyst and had started from the right broad ligament,

The next case is that of E.S.B., who was well till the end of last year. He had been a hard drinker before that time and he had very hard work, being a stevedore, but in December last he began to have abdominal pain in the umbilical region with occasional diarrhoea. Three months ago he noticed some blood and mucus in the motions and two or three months ago he began to feel a lump in his abdomen. For four weeks his bowels had been opened no less than ten times a day. On admission a large mass

was found in the abdomen, stretching down into the right iliac fossa. It was distinctly nodulated and moved freely with respiration. This free movement with respiration showed that it was either in the liver or attached to the liver, and although there was no jaundice, yet the nodulation and the general size of the tumour and the fact that it must be in or connected to the liver seemed to leave one with very little doubt that it was malignant disease of the liver. Of course, here also a certain amount of distension and the tumour might have been due to an accumulated mass of faecal matter in the colon; but still the whole mass moved with respiration even the part that was nearest to the right side, so that the whole part of it seemed to be really connected with the liver. The diagnosis, therefore, was that it was malignant disease of the liver. On examining the rectum very little was found, but on the left side there was a small nodule about the size of a cherry and rounded, projecting from the wall of the rectum. About an inch further on was another small nodule about the size of a pea, and between the two the mucous membrane seemed to be a little thickened; almost fat. Then we came across an old cicatrix,

that was all I could feel on the first occasion. His bowels had not been opened for several days and Doctor Croft Hill gave him a dose of castor oil which opened them fairly freely and then on examining the bowel afterwards one could feel quite readily, apparently within three inches of the anal orifice, a mass of about 2½ or 3 inches in diameter, almost cartilaginous and lobulated, so that it gave you the feeling when you pressed against it as if you were pressing against a cauliflower, only the head of the cauliflower had a cartilaginous hardness. In the centre of it you felt a depression corresponding to the lumen of the bowel but you could not get your finger far enough into it; it only went in about a quarter of an inch or a little over and then stopped. I did not try to pass a probe or bougie because I did not see that any good was to be gained by it I asked Mr. Cripps to see the case because I thought that in all probability there might be a stoppage of the bowel and that it would be as well to have an artificial opening made above the stricture before any actual stoppage. Accordingly he has taken the case over, but he is inclined to think that possibly the patient may not require an artificial anus because the absorption of the toxic products due to the cancer may kill

the patient before any actual stoppage occurs and he thinks that it is well to avoid doing the operation if one possibly can.

There is another case which is to me very puzzling, namely that of Clara R., in Elizabeth Ward. She came in complaining of weakness, languor and vomiting. She had rheumatic fever two years ago and has not been well since. A month ago she had pain in the joints and a week before she came in she vomited everything, but the vomiting ceased on admission. On examination it was found that she had a venous hum in the jugular, a systolic murmur over the heart and the apex beat was three quarters of an inch outside the nipple line and there was a systolic murmur there also; so that there was evidently a good deal of anaemia and a certain amount of mitral regurgitation with dilatation of the heart. But that was not what she was brought in for, at least these were not the points that excited our attention chiefly. It was that there existed a tumour over the region of the stomach, and which was felt to reach back almost from the centre of the middle line near the umbilicus

back into thr left lumbar region. This tumour was quite hard, nodulated on the surface and fluctuating. There was a good deal of resonance. It was clearly not the spleen because one could get the splenic dulness quite apart from it. It was unlike spleen too, in-so-far that it was nodulated on the surface. At the first feeling it seemed as if it were either a kidney affected with malignant disease from a malignant mass close to the kidney, or else a skibulous mass in the splenic flexure of the large intestine. In order to clear away the last possibility, large enemeta were administered and these, I think, brought away some scybala and altered the size of the tumour, so that it became smaller and less rough. In all probability, therefore, the tumour was apparently due to accumulation of faecal matters, but then, they did not clear away entirely. It has now changed, however, in appearance. I confess that I thought it was probably malignant and I expected it to grow, but instead of growing larger it seems actually to be getting less, and instead of this big, solid, ndoulated mass, which we found at first, we now find that the mass has resolved itself into two parts. The kidney can be felt quite smooth, and be separated from an apparently rounded

fluctuating mass in front of it. I asked Mr. Cripps to see the case, and he said that he thought the original tumour was a thickening in the stomach due to an ulcer. I did not feel inclined to accept this view, because I have never seen any such thickening as that due to a simply ulcer, except when the condition was acute, and then there was great tenderness, which we did not find in this patient. I thought that it probably lay between malignant disease and some inflammation around the kidney, involving, possibly, the bowel, because occasionly one could feel, as it were, bits of bowel which seemed to be matted together. It is just possible, however, that the condition may be due to a double cause, namely, a thickening in the stomach itself, giving rise to the pancake shaped mass that we feel now, and some gastric inflammation giving rise to adhesions to the kidney. I had thought that I should find some light upon this case from a private case that I had at the same time under observation. This was a very interesting case also. When I saw her the liver was slightly enlarged with a curious curved edge, and there was in the region of the splenic flexure a mass which was rounded, hard, resonant in front, and could be pushed backwards and

forwards between the two hands when one hand was put behind and the other put in front. In this case also, I thought that the enlargement might be due to accumulation of faecal matters, and the administration of large enemeta seemed at first sight to show that the diagnosis might be right. It not only brought away a good deal of skibula and the tumour altered in appearance, but some of the stuff that came away was of a very peculiar character. The doctor called it "concrete" and really there is no word which would so exactly describe it. It was just like the concrete that is used for making floors, and on chemical examination it seemed to consist of almost pure silica. How she had got this I cannot understand. It seems to me most likely to have come in flour, because the only places where you are likely to get silica in large quantities are from grind-stones, and these might possibly yield to the flour and so we might get a faecal accumulation containing quantities of silica. But although she appeared to improve very considerably for some time, I saw her again after about a month, and the tumour had then altered, as I have said, in appearance. It was not so large, but on the right side under the liver had appeared another mass. This second mass

might have been due to a second faecal accumulation, but it was not likely that such was going to occur when the patient was being constantly treated by enemeta. So, as this mass also must have been attached to the liver, because it moved freely with it, I began to give up hope and to think the patient must have malignant disease. Unfortunately, the diagnosis was only too correct. It did not seem at all a case that was favorable for operation, but the poor lady was very anxious to live and to take every possible chance for the sake of her family; so she had the operation. The colon was short-circuited so as to leave the large mass outside and thus the danger of any obstruction at the splenic flexure was obviated, but not very long afterwards she died quite suddenly.

The only other case that I will allude to to-day is one that is interesting to a certain extent, because I can bring proof of the diagnosis before you. This was a lady whom I saw five years ago for a little swelling over the liver. It was of the shape and size as in Diagram 1, and about a month later it got a little bigger and altered its position as in Diagram 2. A little later still it began to get smaller again and about a year after I saw her first it had become very

considerably smaller and had changed its shape, as shown in Diagram 3. This small tumour, which was about two inches in its longest diameter and about half an inch in its smallest diameter was transverse and when the lady took a deep breath the tumour was found to have the appearance as shown in Diagram 4, almost like the head of an electrode. Sometimes, however, although the tumour remained for some years exactly the same size, it did not have quite the same position, because on other occasions it was more like an olive shaped electrode. My diagnosis was that she had got one gall-stone, probably the shape of a pigeon's egg, perhaps a little bigger, but just there or thereabouts, and that this sometimes laid transversely, at other times lay vertically. I did not advise an operation at all because it seemed to me as the stone was lying perfectly quiet that there was no necessity for operation, but somehow or another the lady was not satisfied and she determined to have an operation. This was performed this morning and here is the stone which, as you see, is rather an unusual specimen. It was taken a little over three hours ago from the patient's gall-bladde The gall-bladder was found to be quite small and contracted; there was hardly any bile and the gall-bladder had contracted

upon the stone. The stone was then lying in the position I have shown with its long axis in the vertical direction, not in the longitudinal direction, as it sometimes was. The size and shape of the stone accord exactly with what one had told the patient before, and it is satisfactory to find that one can sometimes be right in abdominal cases, although, unfortunately, one is obliged to acknowledge that one may be very often wrong. In every case were you have to deal with abdominal disease I think it is well not to be in too great a hurry to give a diagnosis if you can have time to wait, but sometimes there is no time to wait and you have to decide at once upon the question whether an operation is advisable or not. Well, as a general rule, if the operation can be done under favourable circumstances, there is less chance of risk by doing it than by waiting too long, and the only cases in which I am inclined often to delay somewhat are cases of appendicitis, which seem to get well in a very remarkable way if you put them upon salicylate of soda and belladonna, giving them 20 grains of salicylate of soda every two hours, or even more if you like, and 10 or 15 minims of the new

tincture of belladonna every two hours, alternating the two or giving them together as you prefer, but not giving them together in mixture; so that you are able to stop one or other as soon as the physiological effects of that particular drug manifests itself. You stop the salicylate of soda when the ears begin to ring and the belladonna when the mouth begins to get dry. Under this treatment you will very often find the symptoms of appendicitis subside with very great rapidity, so great that on one occasion after I had given orders that the patient should be operated upon for acute appendicitis at the hospital, when I came down again next day I was astonished to find that no operation had been performed. On asking the reason why I found that she had recovered with such great rapidity that when the surgeon arrived he decided that it was not advisable to operate, and she got perfectly well without any bad symptom. One point which is to be noted is that in two cases I have had the complaint that the patient went off his or her head before any other symptom of belladonna poisoning became evident, before even the tongue became dry or the pupil dilated. In both of those cases

there was madness in the family, and it seemed that the belladonna had developed the latent tendency to nervous excitability. But still there is no risk from the belladonna itself nor yet from the salicylate of soda and unless you think that any perforation has occurred I think it is advisable, especially in first cases, not to be in too great a hurry to do the operation, but to give them a chance with the salicylate of soda and belladonna before.

SYRINGOMYELIA. (Duplicate)

Clinical Lecture delivered by Dr. T. Lauder Brunton.F.R.S. at St. Bartholomew's Hospital, Friday February 11th.1898.

Gentlemen:- Some cases are interesting because they are so very common; a case of measles, for example, is interesting clinically because every man in his practice is sure to meet with this affection, and it is necessary that he should be able readily to recognise and to treat it. Some other cases are interesting clinically because they are uncommon. The case that I intend to bring before you to-day belongs to the latter class. This man, John S. is a hawker aged 39. At the age of three he had, what he says was, a cancer removed from the lower lip by Sir James Paget, and the scar still gives a curious appearance to the man. With this exception, he remained perfectly healthy till about three months before his admission. As a hawker, he was much exposed to changes of temperature, and one day on awaking he felt sick. He vomited,the quantity brought up being very large, and the straining was so great that he vomited a certain amount of blood. This irritability of the stomach continued for fourteen days, and during that period he brought up nearly everything that he took. At the end of this time, he began to feel exceedingly weak, as was quite natural.

In addition to the weakness, however, he suffered a good deal from pains in the arm and subsequently he found that he was unable to walk. He was brought into the Hospital and when put to bed the first thing that struck one on looking at him was that he was pale. On examining the chest, we found nothing remarkable excepting that there was an anaemic bruit over the pulmonary artery. The next thing that one noted was the muscular weakness, and especially the position of the left hand. As you see, the wrist has dropped. You will observe, however, that he can raise the arm, but he cannot extend it at all. This characteristic appearance of the hand led me to diagnose rather hastily that he was suffering from lead palsy. He had nothing whatever to do with lead in his occupation, but a great many of the cases of lead palsy that come to this Hospital get the poison not through their occupation but throughtheir food, the most common cause being what is known as "four ale". I do not know very much about this except from second-hand information, so I can only repeat to you what a patient told me when questioned on the subject. Four ale apparently consists of the residue of ale that overruns the glasses when they are served out to customers. This residue falls into a pewter trough and then passes into pipes which lead to the vat below.

This so-called four ale is sold at a lower price than the other ale and so it is frequently drunk. Now, the amount of lead that is got from the trough and from the pipes is very small, but lead is very slowly eliminated, and if it be taken even in very minute quantities for a length of time, it accumulates in the system and leads to lead poisoning. In order to ascertain whether he had suffered from lead poisoning or not, I looked at his mouth. There was no blue line over the greater part of the gums, but there was a distinct blueness around the root of one tooth. I have before seen in cases of marked lead poisoning this limitation of the lead line. In the first case that I noticed, it was due to the fact that the man was accustomed to use a tooth-brush very regularly, but in using it he employed only two motions, a straight one across and an antero-lateral one. In this way he did not cleanse the whole of the gums, but left a little bit that was not reached just at the corner, and here the blue line appeared. So that, although the blue line was so limited in this case, I nevertheless believed that the patient was suffering from lead palsy.

Now, in lead palsy you very often find that there is a good deal of pain, and the pain in the limbs are also attributed to the lead. The general weakness, indeed in the limbs throughout, the special weakness in the extensors of the arm and the

pains in the limbs, I attributed to the action of lead upon the nerves giving rise to a neuritis, because a peripheral neuritis is the most common lesion in lead poisoning, although apparently in some cases, especially those where you get much atrophy of the muscles, the lead may act also upon the muscles themselves, and also upon the cells of the anterior horn of the grey matter in the spinal cord. So for some days I was content with my diagnosis that the man was suffering from lead poisoning plus the weakness which was consequent upon the gastric irritation, constant vomiting, and therefore lessened nutrition. A curious point was observed by the Sister of the Ward, which was that the patient complained of the food he got being cold. However hot it might be, he thought it was cold, and when a hot bottle was applied to his feet he complained that it was cold At my request she put a cold bottle on one occasion to his feet and then he went comfortably to sleep thinking that it was hot. So we had here clearly a great disturbance of the sense of temperature. This disturbance of the sense of temperature has only formed the subject of a special investigation and has only been connected with a special disease within the last ten years or thereabouts. Before going on to discuss the nature of it, perhaps I might just show you how the sense of temperature is

usually tested, and I may warn you beforehand that the areas over which you find disturbance of sense of temperature vary from time to time, and that if you investigate them and make a map of the areas over which you find this disturbance one day, you may find that the chart which you draw on the second day does not coincide. I have here two test tubes one of which contains hot water and the other iced water. I apply these respectively to the patient's hands, and you see with what result. The one that I am now passing round is the one to which we heard given the reply 'cold'. On feeling it you will notice the character of the temperature.

Now, you observe here too, in addition to the alteration in the sense of heat and cold, that there is the paralysis, but you notice also that there is atrophy of the muscles and you can I think distinctly see an alteration in the appearance of the skin, that it looks exceedingly glossy, and you can observe here perhaps even more markedly the disappearance of the muscular tissue in the hands. You see how the space between the fore-finger and the thumb has fallen in, and how the ball of the little finger has likewise become small. We have here then a group of symptoms, viz:-

Paralysis, atrophy of the muscles, disturbance of sensation to heat and cold.

But along with those we have two other points. We have to a great extent a retention of ordinary tactile sensation with an abolition of painful sensation. This abolition of painful sensation was noticed most markedly when the muscles were tested by the faradic current in order to find out how far they had undergone degeneration. Most of you know that a strong faradic current causes very considerable pain. On some places it caused him much pain, indeed rather more than one would have expected in a healthy person, there being a certain amount of hyperaesthesia, but in other places it caused little or no pain, so that we had a regular analgesia. He can tell the difference between the point and the head of a pin quite easily. In the diagram I show you the areas over which we had this analgesia. Fig.1. represents the back. Fig. 2, the front. The right arm was analgesic except at part marked A., where there is slight hyperaesthesia, and also on the left. Over these areas also there was disturbance of sensation to heat and cold. The first thing that strikes one on looking at the diagram is that the areas do not correspond to the distribution of any single nerve; so that we may to a certain extent say that they are not likely to be due to mere neuritis. They do not really correspond exactly even to any segment of the cord. The general look of the

thing is as if there were gloves of anaesthesia, or of analgesia (of disturbance of temperature and of sensation) and this is a characteristic of the disease from which this man probably suffers, namely; Syringomyelia.

If we take now the symptoms that we notice, we shall find on trying to locate them in the spinal cord that we may exclude to a great extent some of the other diseases which are likely to give rise to the symptoms. I show you section of the spinal cord, anterior surface and posterior grey matter, and central canal. (1) are the lateral columns, (2) the direct cerebellar tract, (3) the antero-lateral ascending columns. If there be any disease of the lateral columns, the symptom we generally find is paralysis with a certain amount of rigidity, as in ordinary spastic paraplegia; if there be degeneration of the anterior horns, we find atrophy of the muscles. If both these parts be affected by disease, we find a combination of these two things:- atrophy of the muscles, generally associated with disease of the anterior horns, rigidity, usually associated with disease of the lateral columns, and these two combined give us the form of amyotrophic lateral sclerosis. But you will readilly see that in these diseases we do not get any affection, or at least any marked affection, of the sensory functions.

If the posterior columns are also affected there may be symptoms of tactile sensation being somewhat interfered with, but in order to get the symptoms which we find in this case we must have something more. We have, you notice, abolition of pain, which might be due to some affection of the antero-lateral ascending columns, because, according to Gowers, this part of the cord is that through which the sensations of pain ascend to the brain. But this work of Gowers' is old, and there seems to have been a considerable progress in the physiology of the spinal cord since the time he wrote, and it is now generally recognised that in all probability the sense of pain and the sense of temperature are closely connected in the spinal cord, and the paths through which they ascend to the brain are probably closely associated together. Now the part of the cord in which these kind of impressions seem to be transmitted is in the central grey matter, and when we get diseases which will affect the central grey matter it has been found that the sense of pain and the sense of temperature are either abolished or greatly interfered with, as in the case which we have here. The sense of temperature may be completely reversed, so that heat is felt as cold and vice versa.

The disease which usually is the cause of this peculiar

alteration in the sense of temperature is termed Syringomyelia. It consists in the formation of cavities either in certain parts of the cord about the cervical or lumbar region or even running all the length of the cord.

For a long time there was a good deal of discussion as to the nature of these cavities, some people imagining that the central cord was simply dilated, but now most of those who have been working the subject appear to be agreed that the cavities in the spinal cord are due to the formation first of all of a gliomatous mass generally behind the central canal, and that this gliomatous mass undergoes degeneration, so that the cavity forms within it. There may be, as I have said, two or more cavities, or we may get a cavity extending almost the whole length of the spinal cord, and when the cord is felt after death it may present two different feelings entirely. If the gliomatous mass have small cavities, it will feel more or less rigid as if a piece of wire or a piece of stick had been passed through almost the whole length of the cord, but if the cavities be large then the cord itself will feel soft, because the amount of fluid in the cavities gives a soft feeling to the cord. This fluid is very much like serum, almost exactly as found normally in the central canal of the cord. It seems to vary from day to

day, and so you may find the symptoms to which it gives rise varying also from day to day.

There are a great many points about this disease which it would be very intersting to discuss, but time will not permit, so that I will not enter into them now. I will simply bring again to your remembrance that this disease is generally characterised by muscular atrophy, by paralysis, and by the peculiar dissociation of the sense of touch from the sense of pain and sense of temperature. These are the symptoms upon which one relies in the diagnosis. The case that I have brought before you is one which does not quite agree with the typical cases as described in the books in one or two points. First of all, it does not agree in the onset. You notice that in the case we have been discussing the onset was rather sudden, whereas in most of the recorded cases the onset has been gradual. It is just possible, however, that this patient may have been suffering to a certain extent from the disease for some time before he actually felt it. Occasionally, a sudden onset has been observed which was apparently due to the rupture of a vessel in this gliomatous tumour, which brought on symptoms apparently quickly, although it was really only a sudden exacerbation of a condition that had been existing for sometime before.

It is possible that in this patient the straining during vomiting, which was so violent as to cause him to bring up blood on one or two occasions, may have also led to the rupture of a vessel in the gliomatous tumour and brought about the apparent sudden onset of the symptoms.

The course of the disease is generally hopeless; in fact it seems to be very hopeless so far as one can find from the recorded instances. The patients may improve for a little while, but by and by they fall back again and ultimately they die, not infrequently from intercurrent affections. They have little power of resistance, and so they may catch cold and die from a bronchitis or from a pneumonia or from any other intercurrent affection. We have not very much hope of doing this patient a great deal of good. He has been having electrical stimulation at times, strychnine five minims hypodermically daily and massage daily, our object being as far as possible to increase the nutrition of the wasted muscles. At the same time, you can readily see that as these cavities contain fluid, the amount of which varies from day to day, you may possibly be able to get a considerable absorption of the fluid by the general increase in the patient's circulation. I dare say most of you remember a very striking injection that was made by

Professor Schwalbe, and which showed the very wide distribution of the lymphatic spaces. It struck me very much because I was in Amsterdam working in Juncker's laboratory at the time Schwalbe was engaged on the subject. By injecting into the the name used by Schwalbe for the space around the choroid, some Berlin Blue he was able not only to get the injection passing down the whole length of the spinal canal but even to get it passing into the lumbar lymphatics. You therefore see how widely the lymph system spreads, and you can readily understand that if you can effect general pressure within the lymph system of the patient, you may be able to affect the condition of the fluid inside those cavities, and if you can get it reduced you will lessen the pressure upon the nerve elements themselves. You may thus be able gradually to ameliorate the symptoms and possibly get for some time a very marked remission of the symptoms, and as there is no agent that one knows of so powerful as massage for this purpose, we are giving this patient massage. How far we shall be able to get any marked amelioration I do not yet know. He has certainly improved in many respects considerably, but one does not know that the improvement will continue. After all, we have not very much hope of ultimately getting the patient well.

In conclusion, I would again remind you of the most important points in the diagnosis, namely; atrophy of the muscles, paralysis, retention of tactile sensation along with abolition of the sensation of pain, and more especially the abolition of the thermal sense, or, as in this case, the complete reversion of the thermal sense, so that heat is felt as cold and cold as heat.

Methods of Treatment Old and New

Mr. President and Gentlemen:- The title of the paper which I have the honour to read to you to-night is "Methods of Treatment Old and New." As practical men, you will probably desire to hear more about the new methods, but it will not be without a certain advantage as well as interest to take a glance at some of the older methods. Whenever we speak of ancient medicine our thoughts go back to Hippocrates, but centuries before him Solomon said " There is no new thing under the sun. Is there anything whereof it may be said, See, this is new? it hath been already of old time, which was before us." Now there is some truth in this but it does not contain the whole truth. A field of ~~corn~~ wheat ripe for the reaper is not new. It ~~was preceded~~ is ~~by~~ the wheat which was sown underground months before, which has grown + increased. In one sense it is not new, but in another it is, and the same is true of old and new ideas, old and new methods of treatment. The same sun which shone upon us yesterday shines upon us today, but the sun is a day older, and the world is a day older, and some of those upon whom it shone are one day nearer to maturity and others to decay.

In the same way we find the germs of ideas cropping up again and again, but they rarely come up quite in the same form. Some of them progress in a wrong direction and decay, others again grow to maturity and thereby benefit mankind. It is in the region of art that we find the greatest amount of oscillation, whereas in that of science we find steady progress. The difference between art and science is that art is a practical thing and depends for its success upon the individual whose greater or less success is due to his greater or less knowledge of how to do the thing required, while science is the collective wisdom and involves not only the how but the why. The more science that can be brought to bear upon an object the better is it likely to be done and so the advance of science tends to raise the standard of art.

It is curious to notice how methods of treatment, at first empirical, afterwards may receive a scientific explanation. Thus in the Law of Moses a number of animals are declared unclean and unfit for human food which we now know to be particularly liable to produce parasitic disease

in man. Fish without fins and scales were also forbidden, and we now know that such fish as eels, although innocuous innoxious in countries where ~~it~~ they can be thoroughly cooked, have a blood which is poisonous and might be injurious where fuel not being plentiful the coagulation of the albuminous tissues in the process of cooking was insufficient. In Madagascar among the Sakalava when a death occurs in one of their villages the settlement is broken up and the tribe remove their home some distance from their former abode. This is the very plan which is now found to be most effective in stopping the spread of plague, but the natives of Madagascar believe that the spirits of the dead haunt the spot where they die and do harm to those who remain, while we know that by leaving the place where the plague bacillus has found a nidus the inhabitants are likely to escape the ravages of the disease. The Dayacks of Borneo believe that sickness may be caused by invisible spirits inflicting invisible wounds with invisible spears, and in this idea their imagination appears to picture almost precisely what ~~medicine~~ Metchnikoff has demonstrated under the microscope. (Here shew slides)

In the Middle Ages a great plan of treatment was to cover the wound carefully up and leave it to itself, but to apply a salve to the weapon which had caused it. This salve to the weapon undoubtedly acted like a soothing poultice to the ~~fingers~~ feelings anxieties of those who were interested in the wounded man and prevented them from disturbing the dressings to see how the wound was getting on. In this way the wound in many cases no doubt healed up without any trouble, whereas if it had been constantly opened and redressed every day the chances of serious suppuration would have been greatly increased; but if the wound were dressed first of all with Friars' Balsam, which was I believe at one time a famous vulnerary ~~of~~ in the friars' practice, this would accord very closely with that of modern antiseptic surgery. For Friars' Balsam, better known now perhaps under the name of compound tincture of benzoin~~e~~, is a powerful antiseptic when applied externally and if taken internally it is both an antiseptic and a purgative; so that it would be beneficial to the body both outside and in. The main constituent of Friars' Balsam, and from which it takes its modern name, is benzoin~~e~~, which when heated yields benzoic acid, a well known antiseptic. It has a fragrant

aromatic smell and to the series to which it belongs has given the name of aromatic. Modern chemistry has shewn that benzoine nucleus - a group containing six carbon atoms joined in a ring. This ring may be compared to the handle which one so often sees and to which numerous tools of different kinds can be attached. When hydroxyle is attached to the benzoine nucleus it forms phenol, more commonly known as carbolic acid. When a carboxyle group is attached to it we get benzoic acid. When we have the hydroxyle and carboxyle group both attached we get in a certain position salicylic acid. When we join two benzoine nuclei together and add a hydroxyle we get naphthol, and as this hydroxyle may be placed in different positions two different substances may be formed one α naphthol and the other β naphthol. When we combine the benzoine nucleus with salicylic acid we get salol and when we combine salicylic acid with β naphthol we get bethol. All these substances are useful intestinal disinfectants. They tend to destroy microbes in the intestinal canal, and thus to arrest the fermentation or decomposition of foods which gives rise to the formation of gas and consequently

flatulence, or the formation of irritating substances with consequent pain and diarrhoea. The utility of carbolic acid in one or two grain doses as a pill in flatulence, both gastric and intestinal, is well known. Five to ten grains of salicylic acid in a cachet or a similar quantity of salol or betol, is sometimes even more useful, especially when the fermentation occurs in the intestine rather than in the stomach.

From what I have said, it will be seen that all these substances are closely connected chemically; that a general antiseptic action is common to each, but that each has its own peculiarities which may render it more useful in certain cases and less useful in others. At present a great number of scientific chemists are constantly at work making new bodies belonging to the aromatic series in the hope of discovering amongst them remedies which will excel any of those with which we are at present acquainted. Some of them enjoy a very brief popularity, and though at first they may be boomed and largely used they soon fall into disfavour, while others take their place. Amongst those that seem to have acquired a permanent position, as being really useful

intestinal antiseptics, are phenol, some of the salicylates especially salicylate of bismuth, salol and betnol, while the remedy that has the greatest power of deodorising offensive motions is probably naphthalin. This may be given in ten or twenty grain doses, but its odour is very disagreeable and if put in a cachet the smell comes through. The best way therefore of giving it is to keep it in a powder away from the patient, let someone else put it in a wafer just before administration and then the patient may swallow it without noticing the smell. I do not think naphthalin is such a powerful disinfectant as some of the others, but there is no other so good for destroying the disagreeable smell when the motions are offensive. Naphthalin, being very insoluble, passes through the intestine and is eliminated with the faeces, very little of it being absorbed, but the more soluble antiseptics undergo absorption to a greater or less extent and after circulating through the blood they are eliminated in the urine, where they tend to act again as antiseptics, preventing putrefaction and destroying bacteria. Amongst the best of them are boric acid, salol and urotropine. The

latter, which chemically is hexamethylentetramine, occurs as a colourless powder which may be given in doses of seven to ten grains in a cachet or in solution three times a day. It is extraordinary how under the influence of this drug one finds cases of chronic cystitis recover, the urine becoming clear, free from bacteria or pus and the irritation of the bladder greatly diminished. Not only does it act as an antiseptic to the urine, but it tends to retain uric in solution. It is therefore useful in gouty conditions as well as various other substances which we shall presently have to notice.

During the circulation in the blood, antiseptics no doubt tend to a certain extent to destroy organisms, and the most marked example that we know of probably is the poisonous effect of quinine upon the plasmodium malariae. Bacilli and cocci appear ~~to be~~ resist~~ant~~ (Quinine and Osler lays it down as a safe rule with very few exceptions, that an intermittent fever which resists quinine is not malaria. Intermittent fever with temperature rising daily in the afternoon or evening as high as 102 or 103 and falling in the morning

below normal frequently indicates infection by a streptococcus. It is very common in phthisis, in cases of purulent accumulation in serous cavities or in abscesses and also in a condition which is not perhaps so frequently recognised as the others, viz., ulcerative endocarditis. I am inclined personally to attribute the oscillating temperature in phthisis rather to the conjunction of some other organism
Such as a streptococcus
with the tubercle bacillus than to that bacillus itself and the presence of such temperature in cases where we find no evidence of phthisis or of local accumulation of pus should lead us to examine the heart very carefully and if any indication of cardiac mischief be found we should use the utmost possible precautions. It has been found that streptococci have difficulty in attacking the uninjured valves of the heart, but if these be subjected to mechanical injury the microbes readily find a nidus and lead to extensive destruction. Where no mechanical injury is produced the mere friction of the valves against one another when closed seems to rub them sufficiently to allow the microbes to settle, and if the patient is to recover, absolute rest must

be enjoined.

Within the last three months I have been much struck with three cases who died, and one who recovered. One case died in spite of the rest, but the other two had got up contrary to the directions ~~precautions~~ that had been given to them and were encouraged by injudicious persons to go into the open air and take exercise for the benefit of their health. By so doing they naturally threw a greater strain upon the valves of their heart and thus rendered them more favourable as a nidus for the bacilli. The case which recovered was a lady who obeyed instructions to lie perfectly quiet for more than three months. She then sat up in bed but, fortunately for herself, fainted in doing so. The consequence was that she lay quiet for several months more and ultimately recovered. Undoubtedly, there are certain cases of this disease in which no medicine is of any avail, but the most useful are antiseptics. In two cases which I had in a ward at St. Bartholomew's at the same time, I tried in one benzoate of soda in twenty grain doses every two hours. In the other I tried the liquor hydrargyri

perchloridi, thinking that as perchloride of mercury was such an universal antiseptic it might probably be found more beneficial than the benzoate. At first the boy on the mercury seemed to do better than the other, but after a while the remedy failed to do good and the boy died, and the one who was put upon benzoate of soda recovered. The other remedy which I have found useful is oil of eucalyptus, five to ten minims in capsule every two or three hours or as much, indeed, as the patient can stand without derangement of his digestion.

In rheumatic fever the use of salicylate of soda gives the utmost relief to the patient, and no one who ~~was~~ is able to compare the sufferings of the patients under the old treatment by alkalies and blisters with the rapid relief afforded by salicylate can fail to be grateful for the introduction of this remedy. Under it the pain is relieved, the swelling subsides, and the joints resume their normal appearance. There is no doubt whatever about the usefulness of the salicylate treatment to the joints, but many doubt whether the heart is not quite as often or perhaps more often affected in rheumatic fever since the

introduction of the salicylate treatment. It is very hard to come to an exact conclusion regarding this, but I think it is quite likely that the heart may be affected as often or even more so than it used to be. I do not, however, think for a moment that this is due to the salicylate having less power to influence morbid processes in the heart than the old treatment had, but its very power to relieve pain in the joints is apt to induce patients to get up much sooner, than they would otherwise have done, or, indeed, than they possibly could have done under the old method of treatment. By getting up they at once throw a strain upon the valves and walls of the heart and tend to bring about morbid alterations in the organ. If people would only be content to lie quiet in bed under the salicylate treatment as long as they did under the treatment by alkalies, I have very little doubt that cardiac disease, consequent upon rheumatism, would not be so common as it is at present. The same thing occurs in influenza. The influenzal poison appears to have a peculiar power to weaken the heart, so that five or six days of influenza damage the cardiac muscle as much as a fortnight of typhoid. But

in typhoid, fortunately perhaps for the patient, the muscles of the extremities and trunk are weakened as well as the heart and consequently the patient is unable to take exercise. At the end of four or five days of influenza, however, the patient is able to get up and about with the result that the heart may become permanently damaged, and so we get the history often given by the patient "I had influenza two, three, or four years ago and have never been well since".

It has appeared to me that the slighter cases of influenza are those which lead to the greatest cardiac damage, because the patient thinks that as he has only been ill for a day or two ~~and that therefore~~ there is no necessity for care when he gets up and about again. In the same way also it is the ambulant cases of typhoid, where the patients go on straining their hearts during the first ten or more days of the disease, that they are apt to die. Rest to a weakened heart is as necessary as it is to a dislocated ankle or a broken leg, but, unfortunately, many people will refuse to give rest to the heart until it is too late, although they would at once see the necessity of attending to the sprained ankle or the broken leg. Rest to the

heart is not only a prophylactic but a curative measure, as one sees full well both in ordinary valvular disease consequent upon rheumatism and in mitral regurgitation consequent upon degeneration and dilatation of a hypertrophied gouty heart. In such a case we probably find opposed to the weakened heart a high arterial resistance, and while cardiac tonics such as strychnine and caffein may not be out of place, one requires to be careful with digitalis and rather to help the circulation by dilating the vessels than by stimulating the enfeebled heart.

We know that in cases of severe spasm of vessels we can afford relief by the inhalation of nitrite of amyl or the administration of nitro-glycerine or nitro-erythrol. Inhalation of nitrite of amyl or izobutyl is the most rapid means of lowering the blood pressure, but nitro-glycerine not only lowers it rapidly but keeps it down for a longer time. Nitro-erythrol acts more slowly but for a longer

in half grain doses twice thrice or four times a day

period still, and is one of the best remedies in cases of

for

high tension, ~~and in~~ warding off anginal attacks, ~~but~~ Many years ago an old medical man told me that notwithstanding his very strong gouty history he had kept himself in

exceedingly good health by taking every morning thirty grains of bicarbonate of potash with twenty grains of nitrate of potash. At that time, I supposed that the nitrate of potash simply acted as a diuretic, helping to clear out the products of waste from the system, but now I am inclined to suppose that it has a distinct action upon the arterial tension. The nitrates have an action like the nitrites but they act more slowly and for a still longer time and I believe that my old friend had found out empirically what we are only learning to understand from the researches of recent years, but there are other means still for aiding a failing heart to perform its duties. Besides keeping the patient strictly in bed so that no muscular exertion shall make his heart take one unnecessary beat, we may supplement mechanically the work of the heart to a great extent. ~~for~~ The heart has to maintain the circulation, that is to say it has to drive the blood round ~~from~~ right
the entire circle from
the left ventricle through the periphery, through the veins, through the lungs into the left ventricle again. If, then we can mechanically, by pressure or rubbing, aid the circulation through the capillaries and on through the veins,

we shall actually do some of the work which the heart would otherwise have to perform. The effect of simply rubbing upwards from the periphery is to help the heart by driving the blood on through the veins, but if we add to that kneading of the muscles, we also dilate the vessels through which the blood has to flow and thus we lessen the resistance in front. In some experiments made by Dr Tunnicliffe and myself, we found that the blood flowed three times as quickly through a muscle after as before massage, and when you consider that the vascular area in the muscles is as great as that of the skin and the intestines together, you can at once see what an enormous relief may be afforded to a feeble heart by the proper use of massage. Enfeeblement of the heart commences a vicious circle, for when the cardiac walls get flabby, so that the muscle around the auriculo-ventricular orifices does not contract properly, the valves will be too large for the dilated opening and regurgitation from the ventricles will occur. So long as the pressure in front is great, this condition is not likely to mend, but by lessening the resistance we allow the heart again to contract, the valves again close the auriculo-ventricular orifices, so that each systole again

becomes efficient and the circulation again goes on aright.

In cases of gouty kidney we find as a rule little or no oedema, although the excretion of solids by the kidneys may be very much below the average, and when the heart in such cases begins to fail, we must remember the necessity of not over-taxing the contracting kidney by giving it much nitrogenous matter to excrete. The diet must consist chiefly of farinaceous food and milk, and no doubt the lactose of milk is of value by its action as a diuretic. Despite the action of potash in large quantities as a cardiac depressent, its action upon tissue change in gout is undoubtedly beneficial, and even when the heart is failing in a gouty man the nitrate, bitartrate, the citrate and the acetate of potash are not to be at once condemned as inadmissible for in small or moderate doses they are often beneficial.

In failing heart with dropsy, we have a draught much in favour at St. Bartholomew's consisting of 20 grains of tartrate of potash, 30 minims of spirit of juniper and infusion of scoparium up to an ounce, which in many cases of dropsy renders signal service.

It often happens that gouty men who are apparently for the time being in good health, may have an attack of gout brought on by indulgence in various articles of food, more especially in fresh fruit, but this is exactly what would come on if they went to

Homburg or some other place famous for the cure of gout. If they go to any of those Spas for a week, they would probably become very much worse, but their friends all tell them that they must go through the crisis and it will be all right. So even if an acute attack of gout comes on they are quite satisfied and remain until it has passed off. ~~but~~ If instead of remaining for three weeks they were to remain for five or six days only they would probably come away from the Spa much worse than they were before and would blame it for bringing on the gout. In the same way if a gouty man eats a lot of strawberries at home one day, the chances are that he may have a fit of the gout in consequence. He blames the strawberries and forswears them for the rest of his life. The effect of the one indulgence is the same upon him as a week at Homburg, but if he could eat strawberries every day of his life in all probability he would be much better for them, and I think that other fresh fruit may be used in the same way as strawberries, provided the fruit does not contain too much sugar. Some time ago I saw a new cure for gout. It was a dark-green liquid of a disagreeable odour and taste, and I was told that it had worked most wonderful cures.

In fact, I saw a very gouty old lady to whom it seemed to have been decidedly beneficial. I was told it was obtained from simple vegetables. To me it looked exactly like concentrated cabbage wâter, and I have very little doubt that it was in fact something of this nature.

Many of our diseases are due to the effect of unsuitable circumstances on the organism. Gouty people are very often exceedingly energetic, and we see many of them remain perfectly well if they can have an open air life and abundance of exercise. Under these circumstances they get rid of their waste, but if they have not such exercise, and, more especially, if they lessen the combustion that would naturally go on in their body, by the use of alcohol, they are apt to suffer accordingly. We find, too, that many of them have a liking for flesh and a comparative dislike to farinaceous food and vegetables. One of the great duties of the physician in such cases is to instruct the patient that his tastes which are natural to him and the gratification of which would probably be beneficial to him were he at the same time able to indulge his natural liking for exercise, are bad for him when he is confined and obliged to lead a sedentary life. It is necessary for him under these abnormal conditions to take what to his tastes is an abnormal food and to

limit ~~the~~ his nitrogenous food while increasing his farinaceous diet. In addition to this, however, we are often obliged to aid elimination; elimination ~~by~~ through the bowel, by means of mercurials and salines, elimination ~~by~~ through the skin by vapour or hot air baths, and elimination ~~by~~ through the kidneys by such drugs as urotropine, which I have already mentioned, by salicylate of soda, by tartrates of piperidin, or piperazine, or by lycetol, all of which in from 5 to 10 grains appear to be useful remedies. In addition to this, however, it is not to be forgotten that while these substances may render uric acid more soluble, the great solvent, not only of uric acid but of almost everything else, is water, and that hot water when going to bed, on rising in the morning and again at 11 & 4 will often do the patient more good than all the pharmacopoeia put together.

The subject of modern means of cure is not only a big one, but it is a constantly growing one, and it is perfectly impossible to deal with the whole of it in such an address as this. I have simply tried to draw your attention more especially to some of the means of cure which are not only new, but appear to be really useful, and to trace the treatment by some of them with treatment by older methods.

The EXAMINATION of URINE.

Clinical Lecture: delivered by Sir T. Lauder Brunton, M.D., F.R.S. on Friday, December, 7th., 1900, at St. Bartholomew's Hospital.

Gentlemen:- I must apologize to you for taking as the subject of my clinical lecture to-day, what is most elementary in clinical examination. I do this because it is just possible that there may be amongst you some men who are like an old fellow student of mine. He was thoroughly well up in all the abstruse parts of medicine; he could have lectured to the Examiners upon them, but while he was reading up all those abstruse things he forgot to get up thoroughly the elementary subjects and so the Examiners did not allow him to pass. It is just in case some of you have got such a spirit of scientific investigation that has taken you too far in the study of medicine and you have omitted the elementary things that I think it advisable to give a short demonstration on these very elementary points to-day.

In examinations for licenses to practise, you have to pass a practical examination, and one of the most important

points in it is an examination in urine. You will have a specimen of urine put before you and you will be expected to know something about the examination and possibly to make a diagnosis from the urine itself. You might at first think that this was an unfair thing to do and yet in many cases, it is almost the only thing upon you which you best can base a diagnosis.

Now, first of all, the colour of the urine will give you a good deal of information. If it is pale; why is it pale? Generally, it is pale because the patient has been passing a large quantity of water and the amount of colouring matter manufactured in the body during the day being limited, this urine is pale because the colouring matter is much diluted with water. Here is a high coloured urine. I dilute that with a lot of water and, as you see, it at once becomes a pale coloured urine. The high colour may indicate, then, that the urine is very concentrated; that the patient is passing a small quantity of urine; or it may indicate that there is some abnormal colouring matter present. For example, you see here a very high coloured urine, which probably

contains bile. You can make this probability almost a certainty by a very easy method. Dip a bit of blotting paper into it, and you will see that it at once becomes yellow. One of the best tests of jaundice is the examination of the shirt of the patient, which shows the yellow colour of the bile very clearly indeed, but it may be dependent upon something else, viz., upon blood, as you see here, or it may be dependent upon some other colouring matter not derived from the body at all. A gentleman once brought his wife to me and told me that she was passing blood in her urine and he was greatly concerned about her health. She suffered from dyspepsia. I had been giving her compound rhubarb powder and the rhubarb colouring matter got into the urine, which was rendered partially alkaline by the magnesia in the compound rhubarb powder, which gave it a red colour simulating blood. On adding a little acetic acid, so as to render the urine acid, the red colour at once disappeared, showing of course, that it was due to the rhubarb. Then, the pale colour depends, as a rule, upon great dilution and this dilution may be effected by the patient drinking a lot of brandies and sodas or whiskies and sodas over night, in which

case one finds a very pale urine in the morning. It may be effected by the patient passing a quantity of urine under the influence of nervous excitement. This occurs occasionally in examinations. It may occur also in women who are suffering from hysteria, but it may occur also, without any very definite reason, from some obscure affection of the nervous system in cases known as diabetes insipidus. More commonly, however, a very pale urine, not dependent upon any of those causes, is associated with diabetes mellitus, and there the quantity is also very large. I shall refer to this again presently after discussing the abnormal constituents.

The next thing is; is the urine clear? What is the commonest cause of turbidity of the urine? The commonest cause, of course, is urates. How do you ascertain whether urates are present or not? You ascertain first of all by the colour, which is reddish, but that does not always help you. You may get pale urates just like another deposit, namely, phosphates. How do you tell? By warming. If you warm the urine, the urates will disappear. You never saw urates in the urine that was fresh passed unless

it had been passed immediately into a cold chamber pot and become cooled down, and then they appeared. The reason is that they are soluble at the temperature of the body, and whenever you warm the urine to the temperature of the body the urates disappear. The best test is to heat the tube about the middle so as to allow a certain height above it; because, urine like this may contain albumen. If you warm it up in the middle it will clear up completely and then after you have got the upper half of it cleared up by the application of heat, you then heat the top of it to boiling and see whether you get a cloud or precipitate at the top. If there be any albumen present, it will be thrown down. Now, is it necessary to add acetic acid to this afterwards? Well, no, because you are already aware that the urine I am testing is very acid from the mere fact that the urates are present. You do not get urates thrown down in an alkaline urine. In the specimens before you, there is no definite precipitate in the one I have warmed. If there is, it is very slight, but the test tube is rather dirty and one cannot be positive.

There is another deposit very likely to occur, viz:-

that of phosphates. Phosphates come down in a neutral or alkaline or very faintly acid urine and they are readily distinguished from the urates by not clearing up when they are heated; but, on the contrary, coming down still more thickly. Now, there are a number of men who will come to you thinking there is something very far wrong with them. They say that their urine is quite milky when it is passed. This is a very common thing. It will occur even in healthy men, especially if you take the urine about 2½ hours after breakfast. It is often milky when passed and you ascertain that this milkiness is due to phosphates by simply adding a drop or two of acetic acid, when the whole thing clears up. There is another thing that causes a milky deposit, and that is pus. We have before us no very good specimen of pus in the urine. I think there is a little in one, but it is not a good specimen. Pus in the urine does not clear up completely like phosphates on the addition of acetic acid and on the addition of liquor potassae, it becomes ropy. The liquor potassae softens the pus corpuscles and they tend to stick together and become gelatinous and then you get that sort of ropy appearance.

Then there is another cause of turbidity and that is when the urine has been left too long and it decomposes and then you get a lot of bacteria present. The urine may also become turbid from an excess of mucus. You will see a great deal in the books now about nucleo-albumen, and this term is correct enough, but I think it is rather a pity that it has been introduced. We used to call these things mucus and mucines. There is very little difference between nucleo-albumen and mucines. I worked for six months on this subject many years ago in Amsterdam under Kühne. I made out as far as it was possible at that time the differentiation of the two things. There are a number of mucines and a number of nucleo-albumens, but it is very difficult, indeed impossible, to separate the one from the other and so I should not use the term nucleo-albumen; because using such a term takes away one's attention from the fact that these mucines are derived from the mucous membrane of the urinary passage. If you get a lot of mucus, well it makes the urine turbid. The best way of ascertaining the difference between impure albumen and nucleo-albumen is this:- If you add ferri-cyanide

of potassium to a urine containing a nucleo-albumen and then add acetic acid, it tends rather to clear the urine up, but if you add ferri-cyanide of potassium and then acetic acid to a urine containing true serum albumen, you get a precipitate. Of course, if you get the two things together nucleo-albumen and serum, it is rather a difficult thing to differentiate, but the presence of true serum albumen would indicate to you that you have something serious to deal with, and you can disregard the nucleo-albumen to a great extent.

It may seem to some of you that it is perfectly useless to go through all this. For many of you it perhaps is useless, but I think there may be some of you to whom it is not so, because I have seen a good many men come up for examination and when they were put before a glass containing a quantity of urine with urates, they really did not know what they were doing. The next thing is the reaction. One of the most common causes of an alkaline reaction is decomposition of urine, which may have taken place in the bladder and this is usually associated with a considerable amount of turbidity and sometimes with a good deal of ammoniacal smell.

The natural, healthy urine ought to be acid, excepting when the patient has been taking a good deal of food and you get him in the act of full digestion, when he has got all his acid in his stomach and has not enough to render his urine acid. He has a lot of hydrochloric acid in his stomach and the urine is consequently either neutral or it may be faintly alkaline. If the man keeps his hydrochloric acid in his stomach permanently, so that it does not get back to his blood, you may get a more or less permanent condition of the urine. And in cases where you find that the urine tends to be more or less permanently neutral or alkaline, always look out for a dilated stomach, because it is in such a condition, where the acid is kept in the stomach permanently, that you tend to get the neutral or alkaline urine. Then, the specific gravity helps us a good bit. The normal specific gravity is about 10.20 pr 10.22. On what does the specific gravity depend? Why should we have the urine creating a specific gravity more than that of water? Here we have a lot of water and the specific gravity of the urinometer is floating at nought. If you add to it some salt, you raise the specific gravity. The specific

of urine,
gravity/then, depends upon the amount of soluble constituents contained in it, or on the amount of chloride of sodium, phosphate of soda and other salts, but more especially on the amount of urea. Do not forget that it is not urea alone that raises the specific gravity of the urine, but you may get it raised from a large quantity of salts. The high specific gravity may be due simply to concentration of the urine. When the urine is passed in small quantity, of course, there is little water compared with the amount of solids, and you get a high specific gravity. A low specific gravity depends on the large proportion of water, and in all those cases where you find a pale urine you ought, if there be no abnormal constituents present, to get a low specific gravity. A pale urine and a low specific gravity should always go together and if they do not you may be almost positively certain that there is some colourless ingredient present in the urine which ought not to be there. Now, that colourless ingredient which is found in the urine is sugar, so that you have to test for this. How is that to be done? There are practically four

tests that you need to know, viz:- Moore's, Trommer's, Fehling's and Pavy's. The latter three are modifications of one another. Moore's test is with liquor potassae. You boil it and the sugar being converted into caramel, it gets brown and a brown layer is formed at the top of the urine. To explain Trommer's test, I will take a urine that does not contain sugar. I am using sulphate of copper and I add to that some liquor potassae. On adding these to an ordinary healthy urine a precipitate is thrown down. If you boil that it becomes black, not yellow. It is inconvenient to get a precipitate like that down, but there are certain things that prevent it from falling, and sugar is one. If you repeat that experiment with some saccharine urine, you will find that there is no precipitate, but you get a dark blue solution because the sugar keeps the cuprite hydrate in solution. Well, that is all very good, but in order to prevent precipitates like that from falling, Fehling thought it would be a convenient thing to have always present something that would prevent the precipitation of the hydrate of copper, and so he added some Rochelle salt, and that keeps the cuprite hydrate in solution just as well

as sugar. Trommer's solution then is copper sulphate and caustic potash; Fehling put in a little Rochelle salt. When I was a student caustic soda was very common and cheap in Germany, but at that time one could not get it in this country and we had to use caustic potash, and so Pavy used Fehling's solution with caustic potash instead of caustic soda. It was exactly the same and was known as Pavy's solution until a few years ago when he thought he could make an improvement in the test for sugar and so he added some ammonia to Fehling's solution and that now constitutes Pavy"s solution.

These are the most important tests for ordinary grape sugar, but they are all liable to this fallacy, that there are many other substances in the urine which may give you a reduction. For example, excess of uric acid may sometimes do it, and therefore you should test in cases where there are lots of uric acid, by Moore's test. But besides that you want to have something that will be more absolutely certain and the one that is surest of all is the fermentation test. It would take too long here to shew it. It is the one you may depend upon as being the most absolute test

for sugar and it may be used qualitatively and quantitatively. The yeast converts the sugar into alcohol and carbonic acid and you may test the amount either by the amount of carbonic acid given off or by the amount of sugar destroyed. As a rule, we do not trouble about the carbonic acid given off, but we test the amount of sugar in the urine by the lessening in the specific gravity. Now, there are various instruments that may be used, but one of the best really that I know of is two six ounce bottles, with a slip cut into the cork of each. Put into both of them specimens of the same urine; into one of them some yeast about the size of a walnut, shake it well up and set both of them in a warm place for 24 hours. At the end of that time the saccharine urine will have fermented, the sugar will be destroyed and then of course there will be a corresponding reduction in the specific gravity. The reason for having the two under identical circumstances is that you want to compare the loss in the two specimens. If you put one of them in the heat and another in the cold or allow evaporation to take place in one and not in the other, then you bring in a source of fallacy, and that is the reason why it is best to put them exactly under the same conditions.

The nick in the cork is wanted in the case of the saccaharine urine in order to allow the carbonic acid to disappear, otherwise it would blow the cork out. The nick in the second cork is not wanted except in order to keep the two specimens under exactly similar conditions. A small quantity of evaporation may go on through the nick in the cork and so it is better if you want to be very accurate to use two bottles exactly alike and the corks also alike. A question that bothers many men is this: How do you ascertain the amount of sugar in urine by the alterations in specific gravity? It is this. Every loss of one degree in the urinometer corresponds to one grain of sugar in the urine; so that, for example if you have started with a urine of 10.40 and find that after fermentation it comes to, say 10.25 then you know that it has lost 15 degrees of the urinometer, and that urine contains 15 grains of sugar per ounce. The next abnormal constituent of urine is albumen. The ordinary tests for it you know. I think I need hardly go into them and as time presses I think I must pass the albumen over. The question that is rather important is that of blood. You know that if you mix urine containing blood with some ozonic ether and tincture of guaiac, a blue colour occurs. There is another

question often asked: Is there any fallacy in this? There are two. You may get that with spit; with the mucus and protoplasm contained in the saliva; so that if a man spits into his chamber pot and you get some of the spit into the urine you might also get the colour of blood. Another test is with iodide of potassium which gives a simular colour. You can try the experiment for yourselves by mixing a solution of iodide of potassium, and you will find that it is not at all unlike the color of blood but more diffused through and of a more greenish colour and not so blue. Then another question that a man is very often asked is: Does this blood come from the kidney or does it come from the bladder ? Well, you will get that first of all by the reaction. If that urine comes from the bladder, the chances are that it will tend to be alkaline, but if it is fairly strongly acid, you may be pretty sure that that urine is coming from the kidney. Is there anything else that gives this appearance besides haematuria? Haematinuria will give it, and what is the difference? How are you going to distinguish between the two? You put the urine under the microscope and if it is haematuria containing blood, then you find that you get the corpuscles visible, but in paroxysmal haematinuria you get no corpuscles but only granular

débris. Then many men are puzzled by the bile. I have shewn you the first test, and another one is the nitric acid test. You know that bilirubine has a yellowish colour; when it becomes oxidized it changes into biliverdine and so on with progressive oxidation it becomes coloured blue and purple. You can test this in a plate. You will however, very often find that in examinations a plate is not available and it is just as well to know how to do it without a plate. The colours are given in the order of the rainbow; that is you get the green, blue, violet, and round the spectrum again and you get back to a sort of orange. It sometimes shews very fairly well on a bit of blotting paper. When you are in difficulties you can get it very well by filtering two or three times through a piece of blotting paper. Another test is to put sulphur on. The sulphur in pure urine does not fall, but in urine containing bile it falls readily, as it then becomes wetted. A still further test is with tincture of iodine, and with this the bile gives a greenish colour. Is there any fallacy that may mislead you in the nitric acid test as applied to bile? Well, if you get a large quantity of indican you may

be misled because indican is thrown out and oxidizes so as to form indigo or nitric acid and you may get a dark brownish or blackish precipitate which you may mistake for the purple colour given by bile. What is the test then for indican? The test is, you mix equal parts of the urine you wish to examine and strong hydrochloric acid and then add a drop or two of nitric acid or a drop or two of weak solution of chloride of lime. This decomposes the indican, and you get free indigo. You then shake that up with chloroform and the result is a precipitate of the chloroform of a blue colour from the indigo. What is the clinical significance of this? It is that there is decomposition going on in the small intestine, probably from some alteration in the pancreatic digestion, and that if you wish to do your patient good, you better clear the intestine out with a mercurial purgative. Time will not allow me to discuss all I could wish, and so I will just mention two other things that are apt to trouble us. One is the question of the fallacy of the nitric acid test for albumen. I said I should pass it over, but I think I had better allude to it now. When you add nitric acid to urine and get

a cloud down, what are the fallacies? Does the cloud shew the presence of albumen? It does not always. Of course there is one fallacy, namely that you may get a very concentrated urine, and a deposit of nitrate of urea. Another is that you may get a cloud. There are two ways of using the nitric acid test. Some men pour it over the urine, others pour it into the urine, allowing it to slide down the test tube, so that it forms a layer at the bottom. The one I most generally use is to pour it in. If there be albumen present, a cloud forms just above your nitric acid, and close to it, but in a concentrated urine the cloud may look not at all unlike that due to the presence of uric acid, the nitric acid being free from combination with the base. The urates are more soluble than uric acid, but then the cloud forms a little way up, and in a case of concentrated urine where you have to deal with a lot of urates and a certain amount of albumen there may be two distinct clouds, one of albumen close down upon your nitric acid, and another of freed uric acid higher up. Then, another fallacy is the possible presence of copaiba, which is freed and forms a cloud if the patient have taken any.

The only other question I wish to refer to now is the apex beat. Many men are puzzled by it and I thought it might be well to shew you how it does get displaced in the different diseases. I have here one of Luschka plates shewing the viscera in the thoracic and I have made a heart just to fit it. You see where the apex beat comes. In the healthy heart, the left ventricle is just barely visible, and the apex beat comes in the fifth inter-space about an inch and a quarter below and about a quarter to half an inch inside the left nipple. Now, in a case of mitral disease, let us say, where the brunt of the work is thrown upon the right side of the heart and you do not get the right side very much hypertrophied, this is what happens. The apex beat , which is not formed by the left ventricle, but by the right, tends to be pushed outwards and if anything a little upwards. Supposing, however, the case is one of aortic regurgitation. The left ventricle then, is enormously hypertrophied and the consequence is that the dulness is not extended to the right side, as it would be in the case of mitral regurgitation, but the apex beat is formed entirely by the left ventricle and is

displaced downwards. Of course, if there be an enormous hypertrophy with dilatation, you get the apex beat coming outwards as well, but still, it is downwards that is the main point in the displacement of the apex beat in aortic regurgitation, whereas it is outwards that is the main point in mitral regurgitation.

ACIDS.—Definition.—Substances which combine with alkalis, and destroy their power of turning red litmus-paper blue. Most of the acids also redden blue litmus, and have a sour taste; but some—for example, carbolic acid—possess neither of these properties.

Enumeration.—Acids may be divided into *Inorganic* or *Mineral*, and *Organic*. The mineral acids used in medicine are Boric, Carbonic, Chromic, Hydrochloric, Hydrobromic, Nitric, Nitrohydrochloric, Phosphoric, Sulphuric and Sulphurous acids. The organic acids thus employed include Acetic, Benzoic, Carbolic, Carbonic, Chrysophanic, Citric, Gallic, Hydrocyanic, Lactic, Oleic, Salicylic, Tannic, Tartaric, and Valerianic.

Action.—The stronger acids—Sulphuric, Nitric, Hydrochloric, Chromic, Glacial Acetic and Lactic acids—destroy animal tissues, and act as caustics when applied to the surface. When swallowed they produce the symptoms of irritant poisoning. (*See* Poisons.) An antidote for these poisons which is always at hand is carbonate of lime, in the form either of whiting or of plaster chipped from the nearest wall. Other antidotes are alkaline carbonates and bicarbonates, milk, oil and soap. Diluted acids, taken into the mouth, increase the secretion of saliva; and hydrochloric acid forms an important constituent of the gastric juice, without which digestion does not go on. When absorbed into the blood, dilute acids act on the heart generally, slowing its pulsations and reducing the temperature. They are excreted in the urine and milk.

Uses.—Nitric acid is employed as a caustic application to piles, to poisoned wounds, and to spreading or unhealthy sores. Glacial Acetic acid is used to destroy corns or warts. Diluted Acetic acid or vinegar is applied as a lotion to relieve headache; to allay the itching of prurigo, lichen, and psoriasis; to check perspiration; and sometimes to hasten the appearance of exanthematous eruptions. Diluted acids, especially Citric, Tartaric, and Hydrochloric, as well as acid tartrate of potassium, are administered in fevers as refrigerants, because they relieve the dryness of the mouth, and diminish the thirst by increasing the secretion of saliva, as well as lower the temperature and pulse-rate. Under the like circumstances, the organic acids, Acetic, Citric, and Tartaric, when combined with alkaline carbonates in a state of effervescence or otherwise, form agents which act on the skin and kidneys. In febrile conditions, anæmia, and some forms of dyspepsia, the proportion of acid in the gastric juice is insufficient for the proper digestion of food, and the administration of dilute Hydrochloric acid, immediately before or after meals, is useful both by aiding digestion and by preventing the formation of butyric and

other acids, which give rise to sour eructations. Nitro-hydrochloric acid, before meals, is likewise beneficial in preventing acidity. It appears to have some action on the liver, and is used both internally and externally as a lotion or footbath in jaundice and biliousness. It generally relieves the frontal headache common in young females, which is felt just above the eyebrows, and not accompanied by constipation. Dilute acids, especially Aromatic Sulphuric acid, are useful in checking diarrhœa, colliquative sweats, hæmorrhages, and mucous discharges. By lessening the alkalinity of the urine, they tend to prevent the formation of phosphatic calculi, phosphoric, nitric, and lactic acids being most frequently employed for this purpose. Care must be exercised in their administration to nursing mothers, as they are excreted in the milk, and sometimes cause griping and diarrhœa in infants at the breast. Several acids have a special action of their own, and are considered under their respective groups, such as Hydrocyanic and Hydrobromic acids, which are sedatives; Boric and Carbolic, antiseptics; Chrysophanic, parasiticide; Salicylic, an apyretic: Gallic and Tannic, astringents.

T. Lauder Brunton.

EMESIS (ἐμέω, I vomit).—A synonym for vomiting. *See* VOMITING.

EMETICS (ἐμέω, I vomit).—SYNON.: Fr. *Emétiques*; Ger. *Brechmittel.*

DEFINITION.—Agents that produce vomiting.

ENUMERATION.—Copious draughts of lukewarm water, Mustard, Sulphate of Zinc, Sulphate of Copper, Carbonate of Ammonia, Common Salt, Alum, Chamomile, Tartar Emetic, Ipecacuanha, and Apomorphia.

ACTION.—The act of vomiting consists in the simultaneous spasmodic contraction of the diaphragm and abdominal muscles, and relaxation of the cardiac orifice of the stomach, so that its contents are expelled. When the diaphragm and abdominal muscles contract, but the cardiac orifice remains closed, so that the contents of the stomach cannot escape, the expulsive efforts are termed *retching.* The nervous centre which regulates these movements is situated in the medulla oblongata; and it may be excited either directly by the action upon it of drugs carried to it by the blood, or reflexly by irritation of various nerves. The drugs that act directly upon it have the same action, whether they are introduced immediately into the circulation or absorbed by the stomach. They may thus produce vomiting and evacuation of the stomach without being taken into the stomach at all, and on this account they are termed *indirect* emetics, although they act directly upon the vomiting centre. Such are ipecacuanha, apomorphine, and tartar emetic. Similarly the drugs that excite it reflexly are still termed *direct* emetics, because they are applied directly to the stomach. Such are the sulphates of zinc, copper, and alumina; carbonate of ammonium; salt; mustard; and chamomile, which irritate the nerves of the stomach. Tickling the fauces with a feather, or with the finger, also excites reflex vomiting, and may be adopted either alone, or in order to aid the action of other emetics. The terms *direct* and *indirect*, therefore, as applied to emetics, relate to the stomach, and not to the centre for vomiting.

Direct emetics, as they stimulate the nerves of the stomach only, have little action except that of simply exciting vomiting. The indirect emetics, which excite vomiting by their action on the medulla oblongata, act also on other parts of the nervous system, and cause secretion of saliva, secretion of mucus from the œsophagus, stomach, and bronchial tubes, and perspiration. They also cause much nausea, depression of the circulation, and loss of nervous and muscular power. Further, the vomiting they induce is more continuous and violent, and often expels the contents of the gall-bladder, causing part of the bile to flow into the stomach, and be thus evacuated.

USES.—Emetics are employed to remove the contents of the stomach under various circumstances. Firstly, when the food is causing irritation, and not undergoing proper digestion, as, for example, in dyspepsia or sick-headache; and in such cases large draughts of lukewarm water, of mustard and water, or of an infusion of chamomile are usually found beneficial. Secondly, in cases of poisoning; and here mustard, sulphate of zinc, or sulphate of copper are best, as they empty the stomach most quickly and effectually. Thirdly, to cause the expulsion of bile from the gall-bladder, or remove bile from the body/ biliousness, fevers, and ague. When the bile-duct is stopped by a small gall-stone, the pressure exerted on the gall-bladder during vomiting has been known to cause the expulsion of the calculus. In biliousness, excess of bile is more readily removed by vomiting than by purging, as there is no opportunity for the bile to be absorbed on its way from the gall-bladder to the mouth, whereas it may undergo absorption on its passage through the intestines. It is supposed by some that various poisons circulate occasionally in the bile, such as the malarious poison which occasions ague, and possibly other septic poisons which give rise to fevers. The advantage of emetics in ague is undoubted, as it can certainly sometimes be cured by them without quinine, and the action of quinine is always aided by their use. They have also been recommended in

the early stages of continued fevers. In such cases tartar emetic or ipecacuanha are most serviceable. Fourthly, to cause expulsion from the air-passages of false membrane in croup or diphtheria, or of secretions in bronchitis and phthisis. For these purposes ipecacuanha is the emetic most frequently chosen; but if it does not act rapidly in croup, sulphate of zinc or sulphate of copper may be employed, ~~and~~ in cases of either croup or bronchitis, where there is great depression of the circulation, carbonate of ammonium may be used with advantage, as it not only causes vomiting, but at the same time stimulates circulation.

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Perhaps one of the best emetics in such cases consists of powdered alum made into a paste with honey & given in teaspoonful doses.

EXPECTORANTS (*ex*, out of; and *pectus*, the chest).—SYNON.: Fr. *Expectorants*; Ger. *Auswurfsbefördernde Mittel.*

DEFINITION.—Medicines which facilitate the removal of secretions from the air-passages.

ENUMERATION.—The leading expectorants are:—(A) Ipecacuanha, Antimony, and Iodide of Potassium; Chlorides of Potassium, Sodium and Ammonium; and Inhalation of Steam. (B) Squill, Senega, Benzoin, Benzoic Acid, Benzoate of Ammonia; Myrrh, Storax, Balsam of Tolu, Balsam of Peru, Ammoniacum, Galbanum, Assafœtida, Anise, Fennel, Larch Bark, Tar, Terebene, Copaiba, Vapour of Chlorine, Iodine, Ammonia, Creasote, and Carbolic Acid. (C) Ammonia, Carbonate of Ammonia, Strychnia, Nux Vomica, and Belladonna.

ACTION.—The mode of action of expectorants is not well understood, and any explanation of it in the present state of our knowledge can only be regarded as provisional. Expectorants may be divided into two classes:—1. Those which modify the nature of the secretions from the respiratory passages; and, 2. those which modify the respiratory movements by which the secretions are expelled. In considering the mode of action of the first class it must be remembered that the secretions from the respiratory passages depend, like many other secretions, on two factors, the *direct* influence of the *nerves* upon the secreting structures, and the *amount of blood* supplied to them. Each of these two factors may be influenced to a different extent by various drugs. As has already been said, the exact action of each cannot be determined at present, but the first class of expectorants may be subdivided into two divisions which are distinguished in the foregoing enumeration as A and B. The division A rather diminish than increase the activity of the circulation, and are therefore called *sedative* expectorants. The division B somewhat increase the circulation, and are called *stimulating* expectorants. Those comprised under C stimulate the respiratory centre in the medulla oblongata, and increase the respiratory movements.

USES.—Sedative expectorants (class A) are useful when there is congestion of the respiratory passages, with very scanty, tough expectoration, as in commencing bronchitis. In such circumstances, when dry râles are heard abundantly, with few or no moist râles, the patient often coughs until quite exhausted, bringing up scarcely anything. The administration of sedative expectorants renders the secretion from the respiratory passages more fluid, abundant, and easy to expectorate. When these expectorants do not succeed in ordinary doses, their action may be much assisted by the administration of a purgative, or, still better, by giving either ipecacuanha or tartar emetic in such a large dose as to produce sickness and vomiting. When the distress of the patient is great, the abstraction of a small quantity of blood by cupping or by venesection may give great relief. The inhalation of steam alone is also beneficial, and the air of the patient's chamber should be kept warm and moist. by the use of a bronchitis kettle Stimulating expectorants (class B) do more harm than good when administered in the conditions just described, but are beneficial when the acute symptoms have passed off. When this is the case, but the expectoration is tough and somewhat scanty, squill is a useful expectorant; but when the expectoration is abundant, benzoin, balsams, or ammoniacum are preferable. In chronic bronchitis, inhalations of ammonia, chlorine, iodine, creasote, carbolic acid, or pine oil are useful. When the expectoration is fœtid, chlorine, iodine, and carbolic acid inhalations are best. The expectorants which act on the respiratory movements (class C) are useful in cases of debility, as they stimulate the respiratory nervous centre in the medulla oblongata, as well as assist the failing circulation. They may be advantageously combined with stimulating expectorants, such as squill or benzoin, according to the nature of the secretion.

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(38 75) **EXOPHTHALMIC GOITRE** (ἔξω, out; and ὀφθαλμὸς, the eye; and *goître*).—SYNON.: Graves' Disease: Basedow's Disease; Fr. *Maladie de Graves, Goitre exophthalmique;* Ger. *Glotzaugenkropf, Basedows'che Krankheit.* Insert accent

DEFINITION.—Enlargement with vascular turgescence of the thyroid gland, accompanied by protrusion of the eyeballs, breathlessness, palpitation and anæmia.

ÆTIOLOGY.—This disease is comparatively rare among men. It occurs most frequently in women between the ages of twenty and thirty, but is met with amongst older persons. Patients suffering from it often belong to the so-called nervous diathesis. Its occurrence is often preceded by menstrual disturbance and anæmia. Sometimes no exciting cause can be discovered, but in many cases it comes on after violent nervous excitement.

SYMPTOMS.—Before exophthalmic goître makes its appearance, alterations in temper are frequently observed, the patient becoming irritable and depressed. Functional disturbances of the circulation and heart occur at frequent intervals, the heart palpitating, the face flushing, and a sensation of fulness being felt in the head, eyes, and throat. The palpitation increases, the eyes become prominent, and a visible swelling appears over the thyroid gland. The eyes are lustrous and projecting, and there is frequently a slight loss of co-ordination between their movements and those of the eyelids, so that when the eyes are quickly cast down the eyelids follow them so slowly that a white ring of sclerotic may be noticed between the iris and the lower margin of the upper eyelid. Usually there is no disturbance of vision. The exophthalmia is most marked during emotional excitement and at the menstrual period, and at these times the patient suffers from an increased feeling of fulness in the eyeballs. Sometimes the projection of the eyeballs is so great that the lids do not perfectly cover them, and inflammation and ulceration may consequently occur, The thyroid is generally unequally enlarged. Its size varies from time to time, increasing, like the protrusion of the eyeballs, with emotion. It is soft and elastic, and pulsates, so that it has sometimes been mistaken for aneurysm. The palpitation of the heart is generally noticed before either the exophthalmos or enlargement of the thyroid, and is the first symptom to attract the patient's attention. It is increased by emotion or exertion; and the violent cardiac action frequently produces a prominence of the præcordial region. The cardiac pulsations are rapid, and sometimes irregular. The cardiac sounds are loud; and a soft, systolic bellows-murmur is frequently audible at the base, and in the large arteries. The carotids are sometimes, but not always, dilated. The circulation appears to be rapid, the veins filling quickly when emptied, and pulsation being felt even in small arteries. The temparature is frequently high. There is a feeling of general debility. The digestion is sometimes normal, at other times the appetite is diminished or capricious, and diarrhœa may occur. The swelling of the neck may give rise to a feeling of difficulty of breathing; and the voice sometimes becomes altered and hoarse, or may be lost entirely. The course of the disease varies considerably; it may sometimes go on increasing for several months, then it becomes stationary for one or two years, and afterwards begins to decline. The temper improves, the appetite increases, and menstruation frequently is re-established. The palpitation, enlargement of the thyroid, and prominence of the eyes gradually diminish, although they rarely disappear completely. Death may occur from intercurrent disease, from organic cardiac lesions, from uncontrollable diarrhœa, or from gradual wasting. Danger is also said to arise from pressure on the trachea by the enlarged thyroid.

PATHOLOGY.—The protrusion of the eyeballs is due either to dilatation of the vessels in the orbit, or to contraction of the involuntary muscular fibres in the orbital membrane which covers the spheno-maxillary fissure, or possibly to both causes combined. The enlargement of the thyroid is due to dilatation of the vessels of the gland. After the disease has lasted some time, increased formation of tissue in the thyroid gland may occur. Pal-

pitation of the heart is probably due to stimulation of the accelerating cardiac nerves; and this, as well as the alteration in the nerves of the orbit and thyroid, has been ascribed to disease of the lower cervical sympathetic ganglia, in which increased connective tissue and diminution of ganglionic cells have been observed.

Diagnosis.—When the three leading symptoms are present, it is impossible to confound exophthalmic goître with any other disease. The enlargement of the thyroid is distinguished in this disease from that of cystic goître by its greater elasticity, by its paroxysmal enlargement, and by its pulsation. The exophthalmos is distinguished from that due to disease of the orbit or cranium by being equal in both eyes, and by the absence of squint. It is distinguished from prominence due to cardiac disease by the lustrous appearance of the eye; from hydrophthalmia by the natural condition of the pupil; and from the prominence which may occur in myopia by the vision being natural, and by the paroxysmal increase of the prominence in exophthalmic goître.

Prognosis.—This must be guarded, the disease not being very amenable to treatment, and very rarely disappearing altogether, although after continuing for some years it may gradually improve.

Treatment.—The treatment of exophthalmic goître chiefly consists in securing fresh air, gentle exercise, the avoidance of the least fatigue or emotional disturbance, and careful diet. Iron is sometimes useful, the milder forms, such as the tartarated iron or citrate of iron and ammonia, being preferable to the more powerful preparations. The writer believes he has seen much improvement from solution of calcium chloride or from saccharated solution of lime. Quinine, alone or in combination with digitalis—and perhaps with belladonna—often produces good results. Digitalis and strophanthus are occasionally, but not always, useful. Aloes and myrrh may be employed to keep the bowels open. Galvanism to the neck has sometimes been productive of benefit, one pole being placed in the nape of the neck and the other over the sides of the thyroid tumour. When the eyeballs are so prominent as to become liable to inflammation and ulceration, care must be taken, by means of a shade, to protect them from irritation; and if this should prove unavailing, the inflammation must be treated by appropriate remedies.

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LIVER, Atrophy of, Chronic.—Chronic atrophy of the liver is seen in many wasting diseases, and in old age; the liver then often shrinks, becoming tougher in consistence, but rarely granular on the surface. The cut surface is dark red or pale brown; the acini are either invisible, or else smaller than natural. Frerichs thinks that the blood-vessels are all dilated. The increased toughness seems due to the atrophy of the liver-cells, the meshes of the connective-tissue network being thus brought nearer to each other.

The symptoms of chronic atrophy are merged in those of the primary disease, against which all treatment must be directed.

J. Wickham Legg. (T. L. B)

, like atrophy of other organs ~~occurs~~ may be produced by insufficiency of food. It has been produced experimentally in animals by starvation - more or less complete. ab

LIVER, Atrophy of, Acute Yellow.—Synon.: Fr. *Atrophie jaune aiguë du Foie*; Ger. *Acute Atrophie der Leber.*

Definition.—This is a general disease, likened by Trousseau to a pyrexia. The jaundice, being so prominent a symptom, formerly drew attention too exclusively to the liver; but the same degeneration which seizes upon the liver, likewise attacks all the glandular and muscular organs of the body. The morbid change is a parenchymatous degeneration, called by Virchow and his school a parenchymatous inflammation. It consists in a filling of the cells of a gland with albuminous granules, in such numbers as altogether to hide the nucleus; the albuminous granules are quickly followed by oily particles and drops. In the muscular tissue, the striation is lost, and its place taken by granules, placed irregularly or running lengthwise. These morbid appearances are found in poisoning by phosphorus, arsenic, antimony, alcohol, and other agents, and in all fevers, though in a less degree than in acute yellow atrophy. Buhl was the first to point out that the pyrexial changes were the beginnings of acute yellow atrophy.

Ætiology.—Acute yellow atrophy is perhaps the rarest of all the diseases common to this climate. Of its causes, next to nothing is known. It seems to be more common in women than in men; and in pregnant women than in others.

It has been shown that in pregnant and suckling quadrupeds and laying hens, the liver and kidneys often show cells infiltrated with fat, a fact which may throw some light on the disposition of pregnant women to acute yellow atrophy. Emotional disturbances, such as grief and trouble, and bad hygienic conditions, have been thought by some to predispose to this disease. Others believe that all cases may be traced to phosphorus-poisoning.

Anatomical Characters.—After death it is not uncommon to find the liver of natural size, or even enlarged, in the early stages of acute atrophy. Later on the organ shrinks, so that in extreme cases it may weigh as little as nineteen ounces. It decreases in all diameters, but the left lobe is especially shrunken. The capsule is often wrinkled. On section, there is no longer any appearance of lobules, but an ochre-coloured surface without definite structure, but often mottled. Under the microscope, the liver-cells are found, in the early stages, to be filled with granules, so as completely to hide the nucleus; part of these granules are soluble in acetic acid, others are not. Later on, all trace of liver-cells may be lost, nothing but a granular and oily detritus and pigment being seen under the microscope. If the organ be set aside, it often becomes covered with crystals, stated by Frerichs to consist of leucin and tyrosin.

The spleen is enlarged and soft in the great majority of cases. The stomach and alimentary canal are filled with dark-red or tarry contents, the outcome of hæmorrhage; the tubular glands of the stomach are filled with fattily degenerated epithelium. The muscular tissue of the heart shows likewise fatty degeneration; and the tubules of the kidneys are filled with epithelium in various stages of fatty degeneration.

Symptoms.—Acute yellow atrophy is commonly preceded for some days or weeks by a simple jaundice, in which nothing peculiar can be made out. Delirium and convulsions then suddenly set in, followed by deep coma, stertorous breathing, and dilated pupils. During the

first part of the disease the pulse is natural in frequency, but with the appearance of the convulsions and delirium it rises to 120 or 130. The skin is always yellow, rarely deeply coloured. The urine is natural in quantity, bilious, containing leucin and tyrosin, and towards the end of the disorder, containing no urea, chlorides, or phosphatic earthy salts; a trace of albumin is present. There is almost always constipation; the stools being at first pale, afterwards black from admixture of blood. Vomiting is very constantly present; at the end of the disease, of a black coffee-ground matter. The right hypochondriac and epigastric regions are painful and tender. The liver, at first natural in size, or even larger than natural, decreases daily in dimensions, so that at last percussion may give no liver-dulness at all. With the decrease of the liver, the spleen increases in size. A hæmorrhagic diathesis likewise sets in, as shown by petechiæ on the skin, epistaxis, hæmatemesis, and melæna. The temperature is commonly low, until just before death.

Diagnosis.—The diagnosis is beset with difficulties, and may remain doubtful even after death. Poisoning by phosphorus can hardly be distinguished from acute yellow atrophy, unless the patient own to having taken the drug. The prodromal stage cannot be distinguished from simple jaundice.

Prognosis.—The prognosis is extremely bad: only a very few suspected cases are known to have recovered.

Treatment.—The treatment must be conducted upon general principles. A few cases, in which the diagnosis of acute yellow atrophy has been thought justifiable, have recovered, and these have been treated with the mineral acids and purgatives, aconite, quinine, and camphor. These are therefore the remedies which may be recommended to be used. Local symptoms, such as vomiting or bleeding, must be treated as in other diseases.

J. Wickham Legg.

LIVER, Biliary Accumulation in.—ANATOMICAL CHARACTERS.—When a permanent obstruction to the flow of bile into the duodenum has been set up, serious changes take place in the gall-ducts and the liver itself (*see* GALL-BLADDER AND GALL-DUCTS, Diseases of). At first the liver swells, apparently from the pent-up secretion. It becomes of a deep bilious or olive-green colour, the central parts of the acini being the deeper coloured; on section the dilated

ducts are seen, and bile or a colourless fluid wells out of them. Increase in the consistence of the liver commences; and if the obstruction continue, the organ wastes, becomes much tougher, and shows a granular surface. This increase in consistence is due to an overgrowth of the connective-tissue of the liver, as in cirrhosis, only to a less degree. The amount of over-growth depends upon the kind of obstruction. It is greater when a rough angular gall-stone is the cause, than when an hydatid tumour with its smooth walls presses upon the gall-ducts. This overgrowth springs at first from the gall-ducts, which are greatly thickened, and thence spreads over the connective tissue of the portal canals.

The liver-cells atrophy, as in cirrhosis. They vary much in size. Their contents seem to be chiefly fat and pigment-granules, though neither are of very great amount as a rule. The arrangement in rays around the hepatic venule is quite lost. One of the most important functions of the liver is the preparation of glycogen, and this function seems to be abolished in long-continued jaundice. In animals whose bile-ducts were tied, the writer found the glycogen to disappear not many hours after the ligature was applied; and after puncture of the fourth ventricle, no sugar appeared in the urine.

In some cases of complete obstruction to the bile-ducts, the liver-cells have been found altogether destroyed, nothing but a fatty detritus being seen under the microscope. This is not owing simply to *post-mortem* changes in the liver; but is possibly due to the long-continued action of the bile-acids circulating in the blood upon the liver-cells themselves, as Leyden has pointed out. It is not owing to the simple solution of the liver-cells in the bile, for the bile has not the power of dissolving these cells, as Th. von Dusch has asserted.

SYMPTOMS.—As regards the clinical phenomena of biliary accumulation in the liver, there are, of course, all the symptoms of jaundice and of the disease which leads to it. In addition, the liver at first swells, and may be detected below the ribs for two or three fingers' breadth, but rarely more; it is often painful on palpation. Later on, the liver retreats within the boundaries of the chest. Ascites often shows itself, owing to the disturbance of the circulation in the liver; and the spleen often swells. All these symptoms are, however, liable to be interfered with by the primary disease.

TREATMENT.—The treatment must be directed to the cause of the obstruction of the ducts.

J. WICKHAM LEGG.

LIVER, Cirrhosis of.—Synon.: Granular liver; Hobnailed liver; Gin-drinker's liver; Interstitial hepatitis; Fr. *Cirrhose du Foie*; Ger. *Cirrhose der Leber*.

Definition.—A chronic disease of the liver, in which the organ becomes hardened, and usually more or less diminished in size, at the same time assuming a granular or hob-nailed appearance; these changes resulting from an increase in the connective-tissue, usually caused by abuse of spirituous liquors. The name *cirrhosis* was first given by Laennec to the hardened and shrunken liver, on account of the yellow colour of the granulations in this disease.

Ætiology.—The most common cause of cirrhosis is, undoubtedly, the abuse of spirituous liquors. Spirits, unmixed with water, seem to be more potent in causing cirrhosis than wine or malt liquors. Next after these, but at a great distance, come syphilis, and the immoderate use, it is said, of spices—such as curry, or of coffee. In some rare cases no cause is apparent. The disease is far more common among men than women; it is very rare indeed amongst children. In one of these cases, the child asked the nurse for gin soon after admission into the hospital. Cirrhosis has also been seen among the lower animals, a proof that alcohol is not the sole cause.

Anatomical Characters.—The seat of the disease in cirrhosis is the capsule of Glisson. The connective-tissue, which accompanies the vessels entering at the portal fissure, and which forms a covering for the liver beneath the peritoneum, takes on a very active overgrowth. One result of this overgrowth is a compression and atrophy of the secreting cells of the liver. Another is a hindrance to the flow of blood through the liver; for, although new vessels do indeed form in the new connective-tissue, yet these are by no means enough to carry on the circulation, in the place of those obliterated or destroyed by the advancing overgrowth of connective-tissue.

There are several varieties of cirrhosis. In the first—that which is most common—the liver is shrunken, it may be to one-half or one-third of its natural size. This shrinking is often greatest in the left lobe, so that this may become a mere appendage to the right. At the sharp edge of the liver, there is often nothing left but a semi-transparent tissue, containing none of the elements of the gland. False membranes often join the surface of the liver with the diaphragm or other neighbouring parts. The surface itself is greatly roughened. It shows numberless granulations, varying in size from a poppy-seed to a hazel-nut. The fibrous investment of the liver is greatly thickened; and the peritoneum tears off either in layers, or leaving a granular surface behind. The liver is exceedingly hard and tough; and on section, the cut surface is seen to be made up of yellow islets, imbedded in a white translucent tissue. These yellow bodies are the representatives of the granulations seen on the outer surface, and they are the remains of the natural liver-tissue, separated from one another by the new white connective-tissue. This is by far the commonest variety of cirrhosis, but there are others. One form is *hypertrophous* cirrhosis, in which the liver is greatly increased in size, sometimes more than double its natural weight; but the surface is smooth, and the capsule, though thickened, leaves a smooth surface when torn off. There is toughening of the liver, though not to so great a degree, and the same appearance of the cut surface as in ordinary cirrhosis. In another variety the organ is shrunken, but the surface is smooth, and on section are seen only pins'-points of yellow tissue in the white translucent overgrowth. Whether the hypertrophous variety ever becomes shrunken is still undecided. A third variety is *fatty* cirrhosis, which may be

mistaken at first sight for fatty liver, but the touch shows how tough it is. It sometimes floats in water. There is no everted edge, and on section no acini are to be made out; but the cut surface is indistinct, pale, and yellow. The surface of the liver is smooth.

Under the microscope, using a low power, the tissue of the cirrhosed liver is seen to be broken up into islets, separated by broad bands of what looks like a highly nucleated connective-tissue. The separation between the two appears sharply defined. In some cases the liver-cells may be seen infiltrated with fat. With higher powers, the most striking object in the field is the great abundance of what were once called nuclei, but now lymphatic corpuscles, in the new-formed connective-tissue: these vary little in size or shape, being nearly all round or roundish. The prevailing opinion now is that they are emigrated leucocytes. They are arranged sometimes in clusters, sometimes in lines, and sometimes indefinitely. The origin of the clusters is uncertain; but it seems tolerably clear that the linear disposition arises from the obliteration of vessels carrying bile or blood. The connective-tissue itself is highly fibrous; sometimes homogeneous or granular. The liver-cells themselves undergo great changes. They lose their natural polyhedral shape, and become oblong, oval, or spindle-shaped. Between them the new connective-tissue gradually insinuates itself, and the cells become lost in the advancing overgrowth. These changes in the liver-cells are of course best seen at the spot where the liver-tissue and the connective-tissue join.

SYMPTOMS.—The first approaches of cirrhosis are commonly very insidious. Often one of the first symptoms is a dull pain in the neighbourhood of the liver. This is accompanied by signs of a chronic gastric catarrh, of which morning sickness is, for the diagnosis of intemperance, of the greatest importance. The patients are commonly of a sallow, often almost jaundiced, complexion. They grow thinner, and their strength fails. Some patients suffer from piles: in others diarrhœa occurs. Later on the belly begins to swell, and ascites appears; the legs may become œdematous, from the pressure of the fluid in the belly on the anterior wall of the inferior vena cava. The urine is high-coloured; often deposits urates; and sometimes contains albumin from contracted kidneys.

An important point in the diagnosis is to determine whether the liver is of small size, and growing smaller. This is often difficult, on account of the ascites; the difficulty may sometimes be overcome by laying the patient on his left side. In the earlier stages the hard edge of the liver may at times be felt, and even though the ascites be great, by suddenly depressing the walls of the belly with the fingers. The percussion-dulness of the liver in the nipple line may be reduced to two inches or even one inch in height.

Although in the new-formed connective-tissue of cirrhosis fresh vessels form to take the place of those obliterated, yet these by no means suffice to carry on the circulation through the liver. Portal obstruction therefore arises, which relieves itself in various ways; most commonly fluid is poured out into the cavity of the peritoneum, causing an ascites, or into the cavity of the intestines, causing a diarrhœa, which should not be lightly checked. In other cases it is relieved by hæmatemesis, or by hæmorrhoidal discharge. That which is most fortunate for the patient is the formation of a varicose communication between some radicles of the portal system and the general veins; as between the hæmorrhoidal and the hypogastric, the veins of the stomach and the œsophageal. Most important of all, however, is a vein discovered by Sappey. It arises from the left branch of the portal vein, and passes up the falciform ligament close to the ligamentum teres to join the epigastric and internal mammary veins. It is by no means the same as the old obliterated umbilical vein, although so near to it. The vein just mentioned will often be found dilated after death.

As a rule the spleen is enlarged in cirrhosis. The enlargement may be very great, but the organ is commonly about twice or three times the natural size. After death the spleen is found of softer consistence than natural, sometimes pulpy. The cause is obscure; the reason commonly given is the hindrance to the flow of blood through the liver acting on the splenic vein. The spleen, however, does not always swell when there is obstruction to the portal circulation, for example, in nutmeg-liver.

Ascites is a symptom which sooner or later is sure to come on. It appears to arise from the venous stasis in the subperitoneal tissues. Fluctuation, and the movement of the fluid on change of posture are very clear. The fluid, like all other dropsical effusions, contains albumin, salts, sometimes urea, sometimes sugar; and in jaundice bile-pigment. After the ascites has set in, the feet may begin to swell, from the pressure of the fluid on the vena cava. The upper limbs and face are free from œdema. In some cases albumin is present in the urine, from coincident Bright's disease.

The patients often complain greatly of flatulence, which adds much to their distress, and dyspnœa. Hæmatemesis and piles are of frequent occurrence. Diarrhœa when it comes is, as above mentioned, salutary, and should not be checked unless extreme. The urine is scanty and high-coloured; often turbid from urates; and bile-pigment is present when jaundice sets in. Jaundice may or may not be seen, according as the pressure of the new connective-tissue does or does not involve the bile-ducts.

Diagnosis.—The diagnosis depends upon the history of intemperance; the size and consistence of the liver; the size of the spleen; and the appearance of ascites and other dropsies. Of importance also is the peculiar sallow earthy complexion; and the occurrence of hæmorrhages from the stomach or intestines. The diagnosis is often easy; while at other times it is very hard or well-nigh impossible to make. Cirrhosis may be confounded with portal thrombosis; obliteration of the hepatic duct; nutmeg-liver; syphilitic disease, cancer, or hydatids of the liver; and chronic peritonitis.

Prognosis.—It is rare for a patient suffering from cirrhosis of the liver to live longer than a twelvemonth after the symptoms have become so pronounced as to allow a diagnosis to be made. Death is in nearly all cases the end of the disease.

Treatment.—In the early stages of cirrhosis it is most important to induce the patient to give up his habits of intemperance, for without this, treatment will be of little avail. Next the use of alkaline purgatives, with or without vegetable bitters, such as chiretta or calumba, will be very useful. A course of the waters of Carlsbad is often most useful, or other alkaline or iodised waters. The diet must be mild; and exercise on horseback or on foot should be recommended.

In the later stages of the disease the great object will be to keep up the strength of the patient. For the ascites, which often becomes the patient's great trouble, diuretics, especially the saline, and mercurial alteratives may be employed. Paracentesis should be put off as long as possible, as the end of the disease often arrives soon after the tapping, though in some cases the ascites is cured by this operation. The flatulence should be combated by regulation of diet, charcoal, small doses of hydrochloric acid, and carminatives. The bowels must be kept open, but not severely acted on.

J. Wickham Legg.

LIVER, Congestion of. *See* LIVER, Hyperæmia of.

LIVER, Contraction of.—A small liver is met with in cirrhosis, in nutmeg-liver, and in long-continued obstruction to the gall-ducts, in all of which an over-growth of the connective-tissue of the capsule of Glisson is seen. Any kind of pressure on the liver from neighbouring organs will likewise beget wasting. A small liver is seen in old age, and in the marasmus of wasting diseases. The liver likewise wastes if the portal vein be obstructed, or the capillaries in the liver be obstructed, as in pigmented liver. A shrunken liver cannot be looked upon as a disease by itself.

J. WICKHAM LEGG. (T.L.B)

(~~vide~~ See Liver Chronic Atrophy)

LIVER, Induration of.—The liver is commonly hardened whenever it is small. Simple induration is a state in which new connective-tissue seems to replace the proper hepatic tissue throughout large tracts of the liver. Often the organ becomes small and lobulated; at other times it is increased in size, and a case has been known in which it weighed eight pounds, constituting a connective-tissue hypertrophy of the liver. The diseased part presents the appearance of a completely homogeneous, whitish-yellow, firm, hard mass; which under the microscope is seen to be made up of connective-tissue, in which no, or very few, elements of liver-substance can be made out.

J. WICKHAM LEGG.

LIVER, Inflammation of, Chronic.—This is usually only another name for cirrhosis. Sometimes the name is given to a perihepatitis, a thickening and opacity of the capsule enclosing the liver, and beneath which the liver-substance is found hardened and tough, due to an overgrowth of the connective tissue from the capsule. Most pathologists, however, look upon cirrhosis as a chronic inflammation of the liver, and the name is usually restricted to this state. *See* LIVER, Cirrhosis of.

J. WICKHAM LEGG.

(? 7LA)

LIVER, Nutmeg.—Synon.: Fr. *Foie noix de muscade*; Ger. *Muscatnussleber*.—Nutmeg-liver consists in a chronic passive congestion of the organ, a state which may always be brought about when there exists any impediment to the circulation of the blood through the heart or lungs. The radicles of the hepatic vein become filled with blood, and thus the centre of each acinus shows a deep red, while the outer parts are either yellow or of natural tint. A nutmeg appearance is thus given to the liver, which is often shrunken and tough, with adherent capsule, and granular surface. Under the microscope the centre of the acinus is seen to be filled with dilated blood-vessels, which, pressing on the liver-cells, cause them to atrophy, so that in advanced stages of the disease they disappear altogether, and the centre of the acinus is made up of blood-vessels only, but there is no increase of the connective tissue in the same situation. The capsule of Glisson now and then takes on an overgrowth, just as in cirrhosis; and the connective tissue between the lobules and around the vessels is considerably increased. It is to this overgrowth of the connective tissue that the shrinking and hardening of the liver are due.

or yellow from fat or bile pigment.

Symptoms.—The liver may sometimes be felt during life under the ribs, more often not. Slight jaundice is often present. The spleen is not enlarged, but is small—the opposite condition to that found in cirrhosis.

Treatment.—This must be directed to the condition of the heart or lung upon which the obstruction to the circulation depends. Nutmeg-liver may always be suspected when there exists any impediment to the return of blood from the hepatic veins.

J. Wickham Legg. (T.L.B)

PROOF

Kindly revise & return to

Dr. J. Mitchell Bruce,
70, HARLEY STREET,
LONDON, W.

before Aug. 30th

STOMACHICS (στόμαχος, the stomach). SYNON.: Fr. *Stomachiques*; Ger. *Magenmittel.*

DEFINITION.—Substances which increase the functional activity of the stomach.

ENUMERATION. — The most important stomachics are Alcohol, Acids, Alkalis, Aromatics, Bitters, Arsenic, Pepsin, and Strychnia or Nux Vomica.

ACTION.—In the act of digestion the stomach has the threefold function of secretion, movement, and absorption. By an abundant secretion of gastric juice some of the albuminous constituents of the food are quickly digested; and this digestion is aided by the movements of the stomach, which mingle the gastric juice with the food, and aid solution by breaking up the particles. From the stomach, also, absorption of some of the products of digestion goes on. Some stomachics, such as alcohol and dilute alkalis, increase the secretion of gastric juice; possibly also bitters, and small doses of arsenic. Dilute acids, given after meals, and pepsin supply the essentials of gastric juice when secretion is deficient. It is not improbable that the peristaltic movements of the stomach are increased by strychnia and nux vomica. We want experiments on the action of drugs which increase absorption. It is also probable that some of the good results of bitters are due to their preventing abnormal processes of fermentation in the stomach.

T. LAUDER BRUNTON.

Urgent

Kindly revise & return before November 12th.

TONICS (τόνος, tension, tone).—Synon.: Fr. *Toniques*; Ger. *Tonische Mittel.*

Definition.—Therapeutic agents which impart permanent strength to the body or its parts.

Enumeration.—Amongst the most typical medicinal tonics, which impart a feeling of strength, are iron, nux vomica, quinine, and vegetable bitters. As the strength of the body generally depends on the proper action of its various parts, tonics have been subdivided into those which have an especial action on the blood-circulation, digestion, and nervous system.

1. **Blood Tonics.**—Cod-liver oil and other fats, and iron and its salts, are the most important of this group of tonic remedies. Perhaps also phosphate and hypophosphite of lime, salts of potassium and sodium, arsenic and phosphorus should be included. Light, fresh air, good food, bathing, and exercise are valuable adjuncts.

2. **Vascular Tonics.**—The principal vascular tonics are nux vomica and strychnine, digitalis, strophanthus, erythrophleum, squill, and caffeine. The local application of warmth and cold, friction, and massage increase the effect of these medicines.

3. **Gastric Tonics.**—Small doses of sulphuric, nitric, hydrochloric and phosphoric acids, small doses of arsenic, alum, bismuth, copper, silver or zinc, aloes, bitter beer, chamomile, cinchona, casparia, cascarilla, calumba, hops, gentian, orange and lemon peel, quassia, rhubarb, strychnine, and vegetable bitters generally, all impart vigour to the gastric function. Valuable adjuncts are pepsin and hydrochloric acid.

4. **Intestinal Tonics.**—These are chiefly nux vomica, belladonna, rhubarb, the mineral acids and metallic salts just mentioned, and astringents.

5. **Nervine Tonics.**—Nux vomica and strychnine, cinchona and its alkaloids, coca, phosphorus, arsenic and its compounds, salts of iron, zinc, copper, and silver, are all included under this head. The tonics which act especially on other parts of the system increase also the power of the nervous system, and act indirectly as nervous tonics.

Action.—The derivation of the word 'tonics' indicates the nature of their action. When a person feels limp and weak, and unfit for exertion, like a relaxed bowstring, tonics restore the energy and strength, and render him again fit for work, like, as it were, a re-tightened bow. The exact mode in which tonics act is not yet perfectly ascertained, but in all probability they increase the functions of the different parts of the body by aiding tissue-change, either by increased nutrition, increased tissue-metabolism, more rapid removal of waste, or possibly by all three taken together.

Uses.—Tonics are employed in conditions of debility, either of the body generally or of its different parts, the selection of each depending upon the part of the body affected.

In cases where the malnutrition of the body appears to be dependent on the want of the proper constituents of the blood, as in anæmia, struma, or general debility, without any affection of a particular organ, *blood tonics*, including iron, cod-liver oil, phosphates, and hypophosphites are employed; and these are also useful where impoverishment of the blood is due to a definite constitutional disease, such as phthisis, or Bright's disease. In pernicious anæmia phosphorus or arsenic may be used. Where enfeeblement of the stomach appears to be present, as shown by loss of appetite and such signs of imperfect digestion as flatulence, weight, and pain after eating, *gastric tonics* are used. Should its muscular coat be feeble or inactive, as shown by tendency to dilatation, and splashing of the contents on movement, strychnine is especially indicated, and galvanism or systematic kneading may be also employed. Where the stomach is too debilitated to respond sufficiently to this form of treatment, as after long-continued gastric catarrh, or in old age, its work must be partly done for it,

and then such substances as hydrochloric acid and pepsin are useful. When the muscular movements of the intestine are sluggish, as indicated by constipation, and by a tendency to the distension of the bowel with gas, nux vomica and belladonna may be given; and when its mucous membrane appears to be relaxed and flabby, and secreting too profusely, the mineral acids, astringents, and metallic salts may be of much service. When the pulse is soft and feeble, and there is a tendency to vascular dilatation, either general or local, as shown by local congestion and œdema of dependent parts, or by drowsiness in the upright position and sleeplessness in the recumbent posture, *vascular tonics* are serviceable. *Nervine tonics* are used where the nervous functions are imperfectly performed, as shown by dulness, loss of memory, incapacity for work, languor, or tendency to spasm, as in chorea, and also in paralysis. As the functions of this system depend very greatly upon the quality of the blood with which the nervous system is supplied, and on the rapidity of the circulation, the other tonics frequently require to be given in addition to nervous tonics.

In administering tonics, care should always be taken to ascertain that the case is suitable, for in very many cases of apparent debility the imperfect functional activity of the body or of its parts does not depend upon insufficient nutrition, but upon imperfect removal of the products of waste. The proper treatment in these cases is not to give tonics, but to remove the waste products by cholagogues, purgatives, and diuretics. T. LAUDER BRUNTON.

T 120

URINE, Morbid Conditions of.—SYNON.: Fr. *Maladies de l'Urine*; Ger. *Harnkrankheiten*.

INTRODUCTION.—The urine is the excretion by which the products of nitrogenous waste are eliminated from the body. Alterations in its characters give valuable information regarding tissue-change in the body, and may indicate the presence of disease which would otherwise remain undetected. They therefore require detailed attention. Before entering, however, upon the discussion of the morbid conditions of the urine, it will be well to describe briefly its characters and mode of secretion in health.

In reptiles and birds the waste nitrogenous products of the body are excreted as uric acid & urates; and the urine is solid. In amphibia and mammals they are chiefly excreted as urea, and the urine is liquid. In man a certain proportion of uric acid is present either free or in the form of urates. ~~The amount varies~~

Human urine is a clear liquid, of a yellow colour, acid reaction, peculiar odour, and saline taste. It consists essentially of a watery solution of urea, extractive and colouring matters, and salts. Its average specific gravity is about 1,020, but this varies according to the proportion of solids it contains.

Secretion of Urine. — Until lately, the theory of Ludwig regarding the secretion of urine was the prevalent one. He believed it to be a process of filtration of water and salts from the vessels in the glomeruli, and that these were partly reabsorbed in the tubules by the cells lining them. But it has been shown by Heidenhain that the cells of the tubules also play an active part in excreting, inasmuch as sulphate of indigo injected into the blood does not colour the glomeruli, but colours the cells of the tubules. The process of secretion of urine may therefore be looked upon as consisting of two parts—first, the filtration of water, and probably of a small quantity of salts, which takes place under pressure from the vessels of the glomeruli; and secondly, the excretion of urea and other solid constituents by the epithelial lining of the tubules. The water which exudes from the glomeruli dissolves and removes the substances excreted by the tubules, and is very possibly also to some extent reabsorbed in its passage. ~~The higher the tension of the blood in the glomerular vessels, the more rapid is the secretion of urine; or, to put it more exactly,~~ The more rapid the flow of blood through the glomeruli the ~~greater the difference is between the tension of the blood in the blood-vessels and the fluid in the tubules,~~ the more rapid is the secretion of urine. The secretion may therefore be increased either by raising the pressure in the ~~vessels~~ glomeruli arteries, or by diminishing that in the tubules; and, *vice versâ*, it may be diminished by lessening the blood-pressure in the glomeruli, or by raising the pressure of the urine in the tubules or veins. The blood-

But it is not the simple rise in blood pressure which causes increased secretion of urine it is the more rapid flow of blood through the blood-vessels of the kidney. As we have just seen a high pressure in the tubules may lessen secretion although the pressure in the arterioles be high and the same is true of a high pressure in the veins of the kidney such as we find in ~~cardiac~~ mitral disease. ~~A free flow~~ The conditions for ~~of~~ urine then are (a) ~~free~~ quick flow of blood through the kidney (b) slight resistance in the ~~tubules~~ urinary tubules & passages.

pressure may be raised either generally throughout the body, or locally by dilatation of the renal arteries. These arteries have considerable power of contraction, so much so that they can lessen the pressure in the glomeruli even when it is raised throughout the body generally. The blood-pressure may be raised in the body generally by the contraction of the arterioles from exposure to cold, by mental excitement, by the influence of food, or by the action of certain drugs, such as digitalis. It may be lowered by shock, by exposure to external warmth, or by rise of the bodily temperature, as in fever. It seems probable, from experiments made by the writer and Mr. Power, that the arterial tension in the glomeruli may be locally diminished even when the general blood-pressure is increased, by the action of digitalis, which, while causing contraction of the vessels generally, affects those of the kidney more especially, and thus, by their contraction, lessens the blood-supply to these organs. The vessels of the kidney are controlled by the medulla oblongata; and when this is stimulated, either directly by a galvanic current or by asphyxial blood, or reflexly by irritation of a sensory nerve, the renal vessels contract. Dr. Roy has shown that they are also very sensitive to slight changes in the chemical constitution of the blood, water or urea causing slight contraction, followed by greater and longer dilatation. Digitalis does so also; but the contraction is much longer. Common salt, nitrate of soda, and acetate of potash cause dilatation without previous contraction. They act upon the vessels even when the nerves are cut, and therefore they must affect them either directly, or through some local vasomotor nervous apparatus.

By experiments on the kidneys of amphibia, which have a separate vascular supply to the glomeruli and tubules, Nussbaum has found that sugar, peptones, and albumen are excreted through the glomeruli; but that urea is passed out through the epithelium of the tubules, and in passing out causes increased secretion of water from them.

Characters of Urine.—1. **Transparency.** Healthy urine is clear when passed, but after standing some time a light flocculent precipitate falls. This consists of mucus and epithelial cells from the urinary passages. A hummocky, white, and sharply defined upper surface indicates the presence of crystals of oxalate of lime in the cloud. Small white flocculi of this size and shape, looking somewhat like small worms, may occur suspended in the freshly-passed urine of persons who have suffered from gonorrhœa or prostatitis some time previously. On microscopic examination they are found to consist of aggregations of leucocytes. The writer has found the presence of these flocculi useful in diagnosing gonorrhœal rheumatism where no history of gonorrhœa was given by the patient.

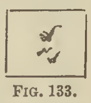

Fig. 133.

Urine which is clear when passed may afterwards deposit sediments of urates or phosphates. These are distinguished from each other by warming the urine. The urates dissolve and the urine becomes clear; but the phosphates are not dissolved, and the urine is rendered more turbid by

the heat. On the addition of a few drops of acid the phosphates dissolve readily, and the urine becomes clear. When the urine is concentrated and contains much urates, it may become turbid almost immediately from their deposition, if it is passed into a cold vessel.

Turbidity of the urine as it is passed is generally, however, due to earthy phosphates, mucus, pus, or blood. The whitish or light colour of the turbidity due to the first three causes distinguishes it from turbidity due to blood. The addition of a few drops of acetic acid causes the turbidity due to phosphates to disappear, while it does not remove that due to mucus or pus. Turbidity due to pus is distinguished from that due to mucus by the presence of albumin. The albumin may be recognised by adding a drop or two of a clear solution of ferrocyanide of potassium to the urine previously acidulated by acetic acid. If the turbidity is not increased it is due to mucus. If it is increased it may be due to pus, or to mucus in albuminous urine. In this case let the urine stand until the sediment has deposited, pour off the supernatant liquid, add a small piece of caustic potash to the sediment, and stir it for some minutes with a glass rod. If it is due to pus it will become more transparent and tough, forming a thick mucilaginous fluid, which flows with difficulty when the quantity of pus is small. When there is much pus it will form a thick, glassy coherent lump. If due to mucus it will not become thick and coherent. If due to blood the addition of a drop of tincture of guaiacum and twenty drops or more of ozonic ether will give a blue colour.

2. **Colour.**—The colour of urine varies from an almost imperceptible yellow to a dark brown or almost a black. Four degrees are usually distinguished—*pale*, *normal*, *high-coloured*, and *dark*. It is usually understood that the description applies to urine seen in a white chamber-pot, from one-third to one-half filled, or more exactly, as suggested by Vogel, in a cylindrical glass about three and a half or four inches in diameter. *Pale* urines are those which under such circumstances vary from an almost complete absence of colour, so that they are indistinguishable from water, except when seen in thick layers, up to a straw-yellow colour. *Normal* urines are those which have a golden yellow up to an orange-yellow colour. *High-coloured* have a reddish-yellow to a red colour; and *dark* urines have a deep red-brown or blackish colour.

These variations in the colour of urine are to a great extent due to the proportion of water in which the urinary pigments are dissolved. Watery urine is pale, and concentrated urine is high-coloured. It is probable that they also depend on variations in the nature of the pigments chiefly present. Sometimes they are due to an admixture of foreign colouring matter, such as bile or blood.

[illegible]
which imparts a red colour to alkaline urine.

Clinical Import.—Pale urine occurs when secretion is rapid, and the urine is consequently dilute, as after copious draughts of liquid or exposure to cold. It is found also in cases of granular kidney, anæmia, chlorosis, diabetes mellitus and insipidus, and after hysterical fits, asthma, or other forms of nervous excitement.

High-coloured urine occurs when the secretion is diminished by profuse perspiration; and also in disorders of the liver, and febrile conditions. The colour of the urine is generally deeper after food, and the urine may be high-coloured after a large meal in healthy persons.

Dark urine generally owes its colour to bile, hæmoglobin, or blood. Bile gives it various tints of brown or green; hæmoglobin or blood imparts a smoky, blood-red, or coffee colour. When blood is mixed with much pus in a strongly alkaline urine, the colour may be greenish-brown. Carbolic acid or creasote extensively used, either externally or internally, renders the urine blackish or black. In cases of melanotic cancer the urine, although of a normal colour when voided, may become black after standing; and this darkening is much accelerated by the addition of nitric acid or other oxidising agents.

3. **Quantity.**—The quantity of urine passed in twenty-four hours varies very greatly. The average may be roughly stated to be about fifty ounces, and the ordinary variation is about one-fifth of the quantity above or below the normal. The quantity is usually increased by anything which raises, and lessened by anything which diminishes, the arterial tension. Thus, cold and nervous excitement will increase it, while warmth and quiet usually diminish it. The quantity passed during the waking hours is much greater than during the hours of sleep; and the fact that the person has to rise during the night one or more times to pass water awakens suspicion of renal disease, or of excessive secretion.

Although temporary conditions may cause the amount of urine passed in one day to differ much from that of another, yet in healthy people it usually equalizes itself in two or three days, unless there be constant disturbing influences, such as persistent cold.

Clinical Import.—(*a*) A persistent *increase* in the quantity of urine may indicate diabetes mellitus, polyuria, waxy kidney, or granular kidney. These are diagnosed by the presence of sugar in diabetes; by the entire absence of both sugar and albumin in polyuria; by the presence of considerable albumin in waxy kidney; and by the presence of albumin—though only in small quantity, and of high arterial tension, in granular kidney. The conditions in which temporary increase in the quantity of urine occurs are exposure to cold, nervous excitement, hysterical fits, copious drinking, the use of diuretic medicines or articles of food containing tartrates or citrates, and the consumption of certain forms of wine and alcohol, as hock and gin.

(*b*) A quantity of urine *below the average* may be due to habit, leading the individual to drink little fluid; or to habitual exposure to heat, leading to excessive perspiration. A diminution in quantity also occurs in acute inflammation of the renal glomeruli or tubules; in subacute exacerbations of chronic inflammatory conditions; and in certain disordered states of the nervous system. It also occurs in cases of granular kidney approaching a fatal termination, and is then a sign of grave import.

4. **Specific Gravity.**— This is most easily ascertained by the form of areometer which

is called a *urinometer*. In using this instrument care should be taken that it is clean and dry before it is put into the urine, and that it does not touch the sides of the vessel. The surface of the fluid forms a meniscus, and the graduation on the stem of the instrument should be read off at the lower edge of the meniscus with the eye on a level with it. When there is not sufficient urine to take the specific gravity, it should be diluted with one, two, or as many times as may be necessary, volumes of water, and the specific gravity taken. The decimal figures of the specific gravity thus found are then multiplied by the number of times the urine has been diluted, in order to get the true specific gravity. Thus if the urine has been diluted by adding four times its own volume of water to it, its bulk is increased to five times that of the original urine. If the specific gravity of the diluted urine is 1002, the specific gravity of the original urine is $1{\cdot}000 + ({\cdot}002 \times 5) = 1{\cdot}010$. The urinometers give the specific gravity at 60° Fahr.; and at any temperatures above this they indicate a lower specific gravity, and at temperatures below a higher specific gravity, than the true one.

The specific gravity of the urine depends on the proportion of solid matters which it holds in solution. The amount of water in the urine fluctuates much more than the solids, and therefore the specific gravity varies also. It is less when the urine is watery, and greater when it is concentrated. The average specific gravity is about 1020, but it may vary in health between 1010 and 1025, or even beyond these limits. It varies in the same person at different times of the day, and in different portions of urine passed at the same time. As the urine is secreted and accumulates gradually in the bladder, it becomes arranged in layers according to its specific gravity, the heaviest layers being lowest. If the person remains quiet, so as not to mix the layers, and passes the urine in successive portions into different glasses, their specific gravity may be found to differ.

In women it may be over 1030 even in health on account of their abstaining from liquid so as to diminish the ~~necessity~~ frequency of micturition under circumstances where it might be inconvenient & evacuations of the bladder ~~might be~~

The specific gravity is diminished during fasting, but is increased after meals, on account of the greater excretion of solids which then occurs. It is diminished when the secretion is quickened, or rendered more abundant and watery by drinking copiously of fluids, by exposure to cold, by mental excitement, or by the use of diuretics. It is increased when the urine is concentrated by abstinence from fluids; by profuse perspiration, which carries off much water by the skin; and by long retention in the bladder, which allows some of the water to be re-absorbed. The variations in specific gravity due to the causes just mentioned are transitory, and are generally succeeded by variations in an opposite direction; so that the specific gravity of the entire urine passed during twenty-four hours may be little altered.

Clinical Import.—A persistently high specific gravity generally indicates diabetes mellitus, or azoturia. It also occurs at the beginning of acute febrile diseases; and in acute nephritis with hæmaturia.

The specific gravity is increased by the presence of albumin alone, as well as by blood. It is

sometimes thought that the mere presence of albumin diminishes the specific gravity of the urine, but this is an error. It is quite true that in certain cases of albuminuria the specific gravity is diminished, but this is due to the absence of other ingredients, and not to the presence of albumin. The writer has found experimentally that the addition of serum-albumin to the urine increases its specific gravity.

An abnormally low specific gravity may indicate contracted or amyloid kidney, diabetes insipidus, or hysteria.

[illegible]

5. Reaction.—Fresh normal urine is generally acid, but when passed after a meal it may be neutral or even alkaline, and sometimes, though rarely, the mixed urine of twenty-four hours may present a similar reaction. Sometimes the reaction is amphoteric or amphogenous, that is, red litmus paper is rendered blue, and blue litmus paper is turned red. The acidity of the urine is chiefly due to acid phosphates, and in part also to free organic acids, such as lactic and hippuric. The amphoteric reaction is probably due to the presence of basic and acid phosphates together. The acidity is less when acid is being secreted by the stomach or skin during digestion or profuse perspiration. It is diminished by vegetable diet, and by alkalies or their salts with vegetable acids. It is diminished in anæmia and chlorosis; and in melancholia or paralysis the reaction may be neutral or alkaline from potassium or sodium carbonates. It is increased by a flesh or a milk diet, by muscular exercise, by drinking, and by acids; and also in fever and diabetes.

When urine is passed with proper precautions into a vessel which has been previously heated, so as to destroy all germs, it may be kept unchanged for years.

Usually it becomes altered quickly, its reaction becoming, first, more strongly acid, then less acid, and finally alkaline. These changes are due to fermentation, which leads first to the formation of acid phosphates, and of lactic and acetic acids, from the extractive matters of the urine, with deposition of uric acid. This increase of acidity is not constant, and deposition of uric acid may occur simply from chemical reaction between urates and acid phosphates. After a varying period the urea becomes decomposed, and carbonate of ammonia is formed, which gives to the urine an ammoniacal odour and alkaline reaction, and causes the precipitation of urate of ammonia, ammonio-magnesian phosphate, calcium phosphate, and calcium carbonate.

The acid fermentation, when present, is probably due to an organism similar to yeast. The alkaline fermentation is probably caused in great measure by bacteria, but it may be induced also by a non-organised ferment, which has been isolated from ammoniacal urine. This ferment appears to be generally produced by bacteria, but it may be produced also, under certain circumstances, by the mucus-corpuscles and epithelial cells in the bladder. Fresh urine inoculated with bacteria from decomposing urine undergoes very rapid change, and the same is the case with the urine inside the bladder when it is inoculated by means of dirty catheters. But similar changes may occur in the bladder in cases of cystitis, even when no instruments have

been introduced, and the ferment in these cases appears to be formed by the mucus or epithelium. In order to distinguish whether the alkalinity of the urine depends on ammonia or on fixed alkalies, the red litmus paper must be dried after being dipped in it. If the alkalinity is due to ammonia the blueness of the paper which it produced will disappear, and the paper return to its original red colour; but the blue will remain if the alkalinity is due to fixed alkalies.

SOLID CONSTITUENTS.—The solid constituents of the urine are the ashes of the body, and their quantity varies with the amount of food consumed, and the amount of waste in the tissues of the body itself. Their quality depends on the nature of the nutritive processes and of the tissue-change going on in the body: and it thus forms a useful indication of the healthy or diseased nature of the tissue-change and nutritive processes. Some solids are constantly present, although in varying quantities, in healthy urine; others are only occasionally present; and others again never occur in health, so that their presence is a sign of disease. Those present in health are (1) *nitrogenous substances*—urea, uric acid, allantoin, oxaluric acid, xanthin, kreatinin, sulphocyanic acid, Baumstark's body, and perhaps guanin; (2) *ferments*—pepsin, nephrozymose or ptyalin; (3) *salts*—chiefly chlorides, sulphates, and phosphates of sodium, potassium, ammonium, calcium, and magnesium, sodium chloride being the most abundant; (4) *acids*—oxalic, lactic, and glycero-phosphoric acids, possibly present in combination, or partly free; sulphuric acid in two forms, simply combined with bases as sulphates, or united with other substances so as to form ether-sulphuric acids of phenol, kresol, brenzcatechin, indoxyl, scatoxyl, &c.; and (5) *pigments*, and pigment-yielding bodies or chromogens.

Abnormal constituents include albumins, blood, hæmoglobin, methæmoglobin, bile-pigments, bile-acids, grape and milk sugar, leucin and tyrosin, lecithin, cystin, fat, &c.

The *quantity* of solid constituents is determined exactly by weighing the dried residue of a given quantity of urine. It may also be ascertained approximately by multiplying the last two figures of the specific gravity by 2·33. This gives the amount per thousand, and from this the total quantity is reckoned. Thus, if a man passes 1,560 cub. cent. of urine daily, which when mixed has a specific gravity of 1,022, then $22 \times 2{\cdot}33 = 51{\cdot}26$ and $1000 : 1560 :: 51{\cdot}26 : 79{\cdot}96$ grammes of solids per diem.

The most important constituents must now be described.

1. **Urea** (CON_2H_4).—This is by far the largest and most important of the organic constituents of urine, as 70 or 80 per cent. of the entire nitrogen excreted appears as urea. The quantity of urea passed *per diem* by a healthy man is on an average 33·18 grammes or 512·4 grains. Urea may be regarded as the ash of the nitrogenous substances, whether food or tissues, which have undergone combustion in the body, and therefore its quantity fluctuates greatly according to the amount of nitrogenous food consumed, and also according to the rapidity of tissue-change. The variations due to the food are so great,

however, that unless the amount of nitrogen in the food consumed be kept rigidly the same from day to day, or food be altogether withheld, they mask the variations due to tissue-change. Hence most of the earlier experiments on the influence of drugs, exercise, &c., on tissue-change, as determined from the excretion of urea, are untrustworthy.

The quantity of urea varies with age, sex, country, and other circumstances; but most of these variations are easily accounted for by the proportion of nitrogenous food taken by children and adults, men and women, English, French, or Germans respectively. Muscular exercise up to a certain point does not increase it, but when excessive it appears to do so; the explanation probably being that in ordinary exercise no destruction of the nitrogenous constituents of the muscle occurs, the energy being supplied by their non-nitrogenous elements, but that when the exercise is too severe and prolonged, the albuminous constituents of the muscles themselves become partially destroyed.

Nitrogenous food, such as meat of all sorts, eggs, and gelatin or substances which yield it, increase the excretion of urea in proportion to the quantity of this sort of food taken. There seems to be a limit, however, beyond which the excretory powers of the kidney will not go, and when this limit is reached, nature saves the organism by diarrhœa, which carries off the excess of nitrogenous food. The addition of fat alone to an abundant diet of meat rather increases the excretion of urea; but when farinaceous food is added to such a diet, the urea is rather diminished. Farinaceous food and fats given to an animal deprived altogether of nitrogenous food, cause it to excrete less urea than if it were totally deprived of food. The addition of farinaceous food and fat therefore appears to lessen the destruction of the nitrogenous tissues themselves.

When much water is drunk, the absolute amount of urea excreted in twenty-four hours is considerably increased, although, the urine being so much more abundant, the percentage of urea is lessened. The increase in urea is said to be greater when the water is drunk during the meal, than when it is drunk after digestion has taken place.

Table and other salts increase the quantity of urea, even when no more water is drunk, and also increase the quantity of water, probably by causing part of the water to be eliminated through the kidneys, which would otherwise have passed off through the lungs or skin.

Moderate warmth appears to diminish the excretion of urea, probably by increasing the secretion of sweat; but when an animal is kept for a length of time at a high temperature, a condition of fever appears, and the excretion of urea is greatly increased.

Quantitative Estimation.—Formerly urea was usually estimated by Liebig's method of titration with nitrate of mercury; but the mode now usually adopted, as being at once accurate and easy, is the hypobromite process. This method is due to Davy, who used hypochlorite of soda, and this was afterwards modified by Hüfner, who introduced the hypobromite in place of

(Hufner's method)

hypochlorite. This method depends on the fact that urea, in contact with alkaline hypobromites ~~or hypochlorites~~, is decomposed, and gives off nitrogen, from the amount of which the quantity of urea decomposed can be readily estimated. Various modifications in the method of applying the process have been introduced, the one in most common use perhaps being that of Russell and West.

hypochlorites (Davy's method) or

The apparatus consists of a tube in which the urine is allowed to mix with a hypobromite solution, and a pneumatic trough, with a measuring tube, in which to collect the evolved gas. The measuring tube is graduated to give the percentage of urea. Another apparatus is that of Dupré, in which the urine and hypobromite solution are mixed in a bottle connected with the measuring tube by an india-rubber tube. Both of these are well adapted for clinical use. In each of them 5 cc. of urine is mixed with four or five times its bulk of the hypobromite solution. This solution is prepared by dissolving 100 parts of caustic soda in 250 of water, and adding, when cold, 25 parts of bromine. The solution does not keep, and is best made by having the soda solution of a proper strength, and adding the required quantity of bromine at each analysis.

The readiness with which crystals of nitrate of urea form on the addition of nitric acid to a solution containing it, affords a means of estimating roughly the quantity of urea present in urine. These crystals do not form in normal urine on the simple addition of nitric acid, but do so in urine containing great excess of urea. Thus, if equal parts of strong nitric acid and such urine—say, half a drachm of each—be mixed in a test-tube, and this be placed in cold water, the crystals will soon make their appearance. Another form of test is easily applied on an object-glass. One end of a small piece of thread is put into a drop of urine on the glass; the drop, and the half of the thread are then protected by a thin covering-glass; and the other end of the thread is moistened with nitric acid. The whole is then put under the microscope, and hexagonal plates of nitrate of urea are seen forming at each side of the thread when there is great excess of urea. If the urine contains the normal, or less than the normal, amount of urea, it must be more or less evaporated by gently heating over a spirit-lamp before the crystals form; and from the extent to which this is necessary a rough estimate of the deficiency of urea may be formed.

Clinical Import.—When the percentage of urea is much above 2 per cent. it generally indicates that the patient is either feverish, or has been perspiring profusely, or that the quantity of water he drinks is too small to ensure the ready elimination of the products of nitrogenous waste. In such cases, if the thermometer does not indicate the presence of fever, or if the patient has not been perspiring profusely, he should be advised to drink more water, in order to prevent the possible occurrence of rheumatic or gouty affections. A small percentage of urea is of much graver significance. It may be due to copious drinking, exposure to cold, or to mental excitement; but when it occurs independently of these causes in

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elderly persons, it very commonly indicates the presence of contracting kidney.

The name *azoturia* has been given to a condition in which the excretion of urea is excessive, in proportion to the weight of the body. In some persons excessive excretion of urea is associated with increased secretion of water, so that the proportion of urea remains normal. In others the water is not increased, and therefore the urea excreted is not only increased in absolute quantity *per diem*, but its proportion in the urine is greater than normal, so that such urine at once gives crystals of nitrate of urea on the addition of nitric acid. Excessive excretion of urea, both absolute and relative to the amount of urine, may occur for a time in perfectly healthy persons, without any abnormal symptom whatever. In others, however, such an excess of urea is associated with gastro-intestinal derangement and nervous symptoms, the patient complaining of acidity and flatulence, but not of thirst or excessive appetite. There is languor, fatigue after slight exertion, bodily or mental, nervousness, restlessness at night, dull pain in the back, and sometimes irritation at the neck of the bladder, with constant desire to pass water. It is probable that in some individuals the nitrogenous tissue-change goes on more rapidly than in others, and that they consequently require a larger proportion of nitrogenous constituents in their food, to enable them to do the same amount of work; and that when indigestion occurs in such persons, the nitrogenous products of imperfect digestion or tissue-waste, acting as nervous and muscular poisons, lead to the symptoms of which they complain. In diabetes there is increased excretion of urea, from the greater amount of food taken by the patients; and it has been supposed by Prout that cases of azoturia might pass into diabetes.

The *treatment* consists in ordering nutritious diet, with a large proportion of farinaceous constituents; moderate exercise; avoidance of fatigue, mental or bodily; purgatives; alteratives; and opium.

2. **Uric Acid.**—($C_5H_4N_4O_3$).—When pure, uric acid forms white crystals, very sparingly soluble in water. It does not exist free in the healthy urine, but is combined with potash, soda, and ammonia. From these it may be separated by the addition of an acid, or by acid fermentation in the urine after it has been passed, as already described.

As deposited from the urine, uric acid is nearly always coloured. It may be deposited in scattered brown specks, or as a dense deposit of red sand, resembling red pepper in appearance; or it may form a thin film on the surface of the urine. The crystalline character of the deposit can generally, though not always, be recognised by the naked eye. On microscopic examination the crystals usually present a somewhat lozenge-shaped form. This form is modified by rounding and by aggregation. When the angles are rounded off, spindle-shaped, ovoid, and barrel-shaped forms are produced. Sometimes they are elongated, so as to produce a rod; and the aggregation of the lozenge, ovoid, and rod-like forms produces stars and spikes, varying considerably in appearance. Sometimes, also, they appear

The absolute quantity of uric acid present
healthy urine varies consider-
-ly like that of urea according
the diet &c but its propor-
-n to the quantity of urea
tolerably constant &
usually about 1 to 33.

like dumb-bells (*see* MICROSCOPE IN MEDICINE). The crystals of uric acid are distinguished by their reddish or brown colour, as well as by their peculiar appearance. They dissolve readily in caustic soda or potash, and separate again on the addition of hydrochloric acid. The chemical test for uric acid is generally known by the name of the murexide-test. It distinguishes uric acid and urates from other urinary sediments, but it will not distinguish free uric acid from uric acid in combination. The mode of applying it is to warm the sediment in a porcelain capsule, with a few drops of nitric acid and a little water, and to evaporate it carefully, almost to dryness. It is then moistened by a glass rod with diluted ammonia, when a fine purple red colour appears, which, on the addition of a drop of caustic potash, passes into a purplish blue.

Quantitative Estimation.—Uric acid is estimated quantitatively by mixing the urine with $\frac{1}{20}$th of its bulk of hydrochloric acid, and setting it aside in a cool place for twenty-four hours. The deposit of uric acid is then collected on a filter, washed with the least possible quantity of water, dried, and weighed; the weight of the filter alone having been previously ascertained. As the weighing is troublesome and difficult, the quantity of uric acid may be ascertained by carefully washing it off the filter, and boiling it with peroxide of lead in a little water, so as to convert it into carbonic and oxalic acids, allantoin, and urea. The amount of nitrogen in this solution is then estimated by the hypobromite method already described. Uric acid contains one-third of its weight of nitrogen, so that by multiplying the weight of nitrogen evolved by 3, one obtains the quantity of uric acid. Besides this ·0045 gramme is to be added for each 100 cc. of the urine employed.

Haycraft.

Another ~~method (Cook's) is to add 3 or~~ 4 drops of caustic soda to 300 or 400 c.c. ~~of urine~~, and, after the phosphates have subsided, to add to 100 c.c. of the clear liquid about 4 c.c. of a solution (1 in 3) of zinc sulphate, sufficient to make the urine faintly acid. This precipitates the uric acid in the form of insoluble zinc urate. The precipitate is washed on a filter with a saturated solution of zinc urate, and then placed with the filter in the urea apparatus, and the nitrogen estimated by ~~the hypobromite method~~, as ~~already described~~. When boiled with liquor potassæ and cupric sulphate, uric acid reduces the latter to cuprous oxide. The writer has seen a case in which the reduction was so great as to lead the patient, who was a medical man, to think that he was suffering from diabetes, and to put himself on an animal diet, by which his condition was of course made worse.

[illegible]

2*a*. **Urates.**—Uric acid occurs in combination with soda, ammonia, and lime; the urate of soda being the most common. The urates, being readily soluble at the temperature of the body, are only deposited on cooling, so that the urine, which was clear when passed, becomes muddy, and a sediment forms, which is commonly coloured like brick-dust, varying in shade, being sometimes almost white and sometimes red. Pale white urates are readily distinguished from phosphates by quickly clearing up when the urine is warmed, while the phosphates do not. Micro-

scopically, the urates of soda and lime are usually amorphous; but sometimes the urate of soda forms globules with projecting spikes, which have caused them to be compared to hedgehogs. The urate of ammonia forms opaque globules, or slender dumb-bells, which are either single or aggregated, so as to form a cross or rosette.

Clinical Import.—Deposit of urates occurs readily after any violent exertion or perspiration, or after errors in eating or drinking. People are often frightened by such deposits, but they are of no importance unless they should persist for a length of time. Persistent deposits occur in febrile conditions or deep-seated organic disease. In cirrhosis the urine is sometimes heavily loaded. *See* URIC ACID DIATHESIS.

3. **Oxalate of Lime.**—Oxalate of lime is recognised by the white, hummocky appearance of the top of the mucous cloud in the urine. On microscopical examination, octahedral crystals are seen, presenting the appearance of a folded envelope. It also occurs in colourless dumb-bells. It is distinguished from uric acid by being colourless, and insoluble in alkalies; and from phosphates by being insoluble in acetic acid.

Clinical Import.—The occasional occurrence of oxalates is of slight importance, and is usually connected with diet. In hospital practice the writer has noticed that when the patients ate cabbage for dinner, a large proportion of them had oxalates in the urine next morning. Persistent presence of oxalates in the urine has been supposed to be connected with a peculiar diathesis (the oxalic acid diathesis), the symptoms of which are languor, depression, and melancholia. It is most probable that both this and the presence of oxalates in the urine are simply due to imperfect digestion, more especially as they often disappear readily on treatment by nitrohydrochloric acid. *See* OXALIC ACID DIATHESIS.

4. **Phosphates.**—Two kinds of phosphates are found in the urine—phosphate of lime, and ammonio-magnesian or triple phosphate. They are always deposited when the urine becomes alkaline through fermentation; and when feebly acid urine is heated, so that the carbonic acid is driven off, phosphates are precipitated in the form of a cloud, which might be mistaken for albumin, but clears up at once on the addition of a drop of acid. Under the microscope, phosphate of lime is amorphous. The ammonio-magnesian phosphate occurs in rhombic prisms, which are distinguished from oxalate of lime by dissolving readily in acetic acid.

Quantitative Estimation.—A rough quantitative estimation of phosphates is made by rendering some urine alkaline with ammonia, and adding an ammonio-magnesian solution to it. A precipitate of ammonio-magnesian phosphate at once occurs if the amount in the urine be normal, but is delayed when the quantity is below normal.

Clinical Import.—In persons having little exercise and a good deal of brain-work, the urine may be turbid when passed, from phosphates present in it. This usually passes away when they get more exercise. It may continue

for months, and is of importance only in so far as it renders the patient liable to phosphatic calculus. Such deposits do not indicate increased quantity of phosphates in the urine, but are simply due to diminished acidity. The writer has found the actual quantity of phosphates present in such turbid urines less than in specimens of clear urine from the same individual. The occurrence of stellar crystals of phosphate of lime in quantity in the urine is, according to Roberts, of grave import, indicating serious disease of some kind or other, although a few such crystals may occur in normal urine. The triple phosphate almost invariably occurs in ammoniacal urine, and generally appears after urine, alkaline from any cause, has stood for some time. *See* PHOSPHATIC DIATHESIS.

The quantity of phosphates is increased in febrile disorders, and in diseases of the nerve-centres and bones; it is diminished in Bright's disease, and sometimes in dyspepsia, as well as after the disappearance of febrile conditions.

5. **Sulphates.**—Sulphur appears in the urine, first, as sulphuric acid, ~~free or~~ in conjunction ~~either~~, combined with many bases or form sulphates, secondly as sulphuric acid with organic radicals forming; ~~secondly~~, thirdly as oxidisable sulphur compounds, for example, taurine; and ~~thirdly~~ fourthly, as sulphur compounds oxidisable with difficulty. The presence of sulphuric acid in simple combination with bases, ~~or in conjunction with radicals~~, is tested by adding barium chloride and ~~hydrochloric acid~~ a excess of acetic acid to the urine, when a white precipitate takes place.

Quantitative Estimation.—Sulphuric acid is estimated quantitatively by means of strontium or barium but for the details of the process the reader is referred to text-books. The oxidisable sulphur is estimated by boiling with nitric acid and chlorate of potash, and then determining the quantity of sulphuric acid present, and deducting from the amount thus found the quantity obtained by the first method. The sulphur oxidisable with difficulty is determined by evaporating a measured quantity of urine to dryness, calcining with nitrate of potash, estimating the sulphuric acid, and deducting from these the quantity found by the second method.

Clinical Import.—The excretion of sulphur in the urine may be used as a means of diagnosing the condition of the secretion of bile. The more sulphur is excreted in the bile, the less appears in the urine, and *vice versâ*. In biliary colic, due to impediment to the flow of bile through the ducts, the easily oxidisable sulphur has been found by Lepine to be diminished, but the difficultly oxidisable to be increased.

6. **Chlorides.**—Chlorine is present in the urine in combination with ammonia, fixed alkalies, or alkaline earths. The quantity depends chiefly on the amount of salt taken in the food. When this is constant the excretion is also tolerably constant; but if a larger quantity of salt be then regularly taken, the excess may not begin to be excreted until after about three days, when it will again remain constant; and the excretion will be in excess for about three days after the quantity taken has been diminished. The body has, therefore, the power of retaining a quantity of chlorine. In acute inflammatory diseases the chlorides are retained completely, so as to disappear from the urine. The usual test for

The ethereal sulphuric acids and salts are not precipitated at once by this ~~method~~ treatment. ~~They can~~ but are precipitated by it after they have been decomposed by boiling the urine ~~after removal of~~ with a mineral acid such as nitric acid

To ascertain the relative proportion of sulphates & ethereal sulphates 100 cc of urine ~~slightly~~ acidulated with acetic acid precipitate with 22 cc. of a 10 percent solution of barium chloride & ~~then~~ filter. The precipitate contains the sulphates the filtrate the ethereal sulphates & excess of chloride of barium. Boil the filtrate with ~~sulphuric~~ strong hydrochloric acid. The ethereal sulphates are thus decomposed and a fresh precipitate which occurs their amount is indicated by the

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chloride is the curdy white precipitate given on the addition of nitrate of silver to urine acidulated with nitric acid.

7. **Pigments.**—These have not yet been fully examined, but they appear to exist in the urine both in the state of pigments and pigment-yielding substances or chromogens. The pigment of normal urine is urobilin, which, according to McMunn, is an amorphous yellow-brown pigment. It gives in solution a spectroscopic band at F, disappearing with excess of ammonia or potash, and being again brought into view by acid. When febro-urobilin is present, caustic soda or potash causes the band at F to disappear, and to be replaced by a band nearer the red end of the spectrum.

+ Chromogens

Normal urobilin appears to be identical with choletelin, the body produced by oxidising acid hæmatin. Normal urine also appears to contain two chromogens, namely, the chromogen of febro-urobilin, and indican. By the addition of oxidising agents to the urine, or by long standing, febro-urobilin may be produced from the chromogen.

The quantity of indican present in normal urine is small. It is tested by mixing the urine with its own bulk of hydrochloric acid, and adding a drop or two of saturated solution of chloride of lime. The indican is thus split up, yielding indigo, which colours the urine blue, and may be removed by shaking with chloroform and allowing it to settle. The supernatant liquid remains of a reddish or purplish colour, from the presence, ~~probably~~, of indigo-red. There appears to be some difference in the indigo-yielding substance, because occasionally the addition of nitric acid to the urine has no effect, although indican be present, as shown by the test thus given, while on other occasions the writer has found the mere addition of nitric acid render the urine a dark greenish-blue, or almost black, from the immediate separation of indigo, which could be removed by the treatment with chloroform just described.

avoiding excess which readily destroys the colour.

possibly

or of some product of skatol (methyl indol)

Clinical Import.—Indican appears to be derived from indol, formed by ~~pancreatic~~ digestion. Indol administered subcutaneously increases the indigo in the urine. The indigo is much increased by partial or complete obstruction of the small intestines. It is less affected by affections of the large intestines. It has also been found increased in tabes mesenterica, phthisis, cancer of the stomach, lymphatic growths, cancer of the liver, Addison's disease, and cholera. It is present in large quantity in the urine of persons resident in the tropics. It appears to be increased by turpentine, oil of bitter almonds, and nux vomica.

albuminous putrefaction in the intestinal canal, or in serous cavities such as the pleura.

Its presence in excess usually indicates the advisability of administering a blue pill and saline to clear the decomposing albuminous substances out of the intestine and the subsequent use of intestinal disinfectants.

A chromogen, yielding a purple colour on the addition of nitric acid, is often met with in cases of anæmia where the urine itself is of a very pale colour, but on the addition of nitric acid becomes almost cherry-red.

8. **Albumin.**—The ordinary form of albumin is serum-albumin. Besides this we have paraglobulin, fibrinogen, propeptone, and peptone. For the tests of these substances *see* ALBUMIN, and ALBUMINURIA; and for their clinical import *see* BRIGHT'S DISEASE; and KIDNEYS, Diseases of.

Albuminuria is, however, much more common

than is usually supposed, and has been found to occur in eleven per cent. of apparently healthy persons presenting themselves for assurance. Its significance in such persons has not been completely ascertained, but it has been found that in many such cases, when they are kept under observation, the health goes on deteriorating. Intermittent albuminuria is not infrequent in persons who have been exposed to malaria; and ~~Dr~~. Quain has observed that intermittent albuminuria in youth is frequently associated with masturbation. In contracting kidney the albumin is usually small in quantity, and may also be completely intermittent, traces of it appearing only in the urine passed after meals, and being entirely absent from urine passed in the morning. This, as the writer has seen, may occur even when the patient is in a very precarious condition, and is already suffering from nephritic asthma. Dr. Mahomed believes that albuminuria may be quite absent in granular disease. Egg-albumin and pro-peptones readily pass through the kidneys (*see* ALBUMINURIA). It has, however, been recently found by Stokvis that if egg-albumin is made to pass through the kidneys for a length of time, the kidneys themselves undergo structural change, glomerular nephritis being induced. These observations confirm the idea, founded on clinical observation by Dr. G. Johnson, that albuminuria with structural kidney-change may be secondary to continued indigestion.

Sir Richard

Quantitative estimation of albumen: The readiest method of is that of Esbach. It consists in filling a tube graduated for the purpose to a mark U with urine & up to mark R with a reagent, allowing it to stand till next day, then reading off on the tube the height at which the precipitate of albumen figure stands. This indicates the proportion of albumen in 1000 parts of urine. The reagent is composed of 20 parts citric acid & 10 of picric acid in ~~[illegible]~~ of water up to 1000.

9. Sugar, —For the tests and indications of ~~sugar in the urine~~ *see* DIABETES.

, Acetone, Aceto-acetic acid

these substances

10. Inosite, or Muscle-sugar.—This occasionally occurs in urine alternately with dextrose. It has no action on polarised light; it does not ferment with yeast; and it does not reduce cupric hydrate, although it causes it to dissolve. It is detected by precipitating the urine first with neutral lead acetate, then with basic acetate, collecting the second precipitate on a filter, suspending it in a little water, and decomposing by hydric sulphide, filtering, and evaporating to a small bulk. A drop is then mixed with nitric acid, and evaporated almost to dryness on platinum foil. A drop of ammonia and one of calcium chloride are next added, and the whole gently evaporated to dryness. A rose-red tinge indicates the presence of inosite.

11. Blood, Hæmoglobin, Methæmoglobin. For the tests and indications of these *see* HÆMATURIA; HÆMATINURIA; and HÆMOGLOBIN.

12. Bile-acids. *See* JAUNDICE.

13. Leucin, Tyrosin. *See* LEUCIN; LIVER, Atrophy of; PHOSPHORUS, Poisoning by; and TYROSIN.

14. Cystin. *See* CALCULI.

15. Abnormal Pigments.—The chief of these are uroerythrin, giving a red colour to febrile urine, febro-urobilin, and urohæmatin. The nature and relation both of the normal and abnormal urinary pigments and chromogens is not yet fully understood. For bile-pigments *see* JAUNDICE.

Melanin.—This black pigment has been found in the fresh urine of patients with melanotic cancer. It appears in the fresh urine as a chromogen, the urine, when freshly passed, being normal in colour; but after standing, or after the

addition of oxidising substances, such as nitric acid, the black pigment melanin is formed. This must not be confounded with the black colour from carbolic acid, or with the black colour due to great excess of indigo already described.

Accidental Pigments.—Chrysophanic acid may occur, from taking rhubarb or senna. The urine containing it becomes red when it is rendered alkaline by caustic alkali. The colour disappears on the addition of acid.

Santonin colours acid urine yellow or greenish. It is distinguished from biliary pigments by becoming cherry-red and purple on the addition of caustic alkali, this colour disappearing on the addition of acid.

The pigments of bilberries, logwood, beet root, indigo, and gamboge also pass to a certain extent into the urine, and the Cytisus alpinus gives it a grass-green colour. After the use, either external and internal, of carbolic acid, creasote, or phenol, the urine may be greenish-brown or almost black. This is due to products of the oxidation of these substances, chiefly hydrochinon. Sometimes the presence of iodide or bromide of potassium in the urine may render it very dark after the addition of nitric acid, on account of the liberation of free iodine or bromine. These are distinguished by their penetrating odours, and may be separated by treating the urine with chloroform and then gently evaporating. T. LAUDER BRUNTON.

(Typhoid ~~reaction~~ test)

Ehrlich's Diazoreaction (In in certain febrile diseases, ty-
phoid fever measles, acute ~~miliary~~ tuberculosis a phthisis, pneumonia + pyaemia but not
in meningitis a subs— occurs which gives a red colour with sulpho diazobenzol
Two solutions are necessary (1) Sulphanilic acid 5 parts, pure hydrochloric acid 50 parts, distilled
water up to 1000 (2) Nitrite of soda 1 part water 200 parts. In using the test 1 part
of the nitrite solution is to 50 of the sulphanilic solution. Equal volumes of
this mixture are shaken up with one fourth volume
ammonia.

VOMIT: Examination of Vomited Matters.—Vomited matters may consist either of substances present in the stomach when vomiting begins, or of substances entering it during the process. Those present in the stomach *when vomiting begins* include articles of food and drink, or other ingesta, more or less altered by digestion or fermentation; saliva, epithelium, mucus, pus, or blood from the nasal passages, mouth, pharynx, or œsophagus; fluid or mucus secreted by the stomach itself, epithelium-cells, casts of tubules, or even shreds of gastric mucous membrane, blood more or less altered proceeding from the walls of the stomach, cells or small pieces from morbid growths, and occasionally, as mentioned by Dr. Quain, the whole of a pedunculated morbid growth; fungi, as torulæ and sarcinæ; parasitic worms; bile; pancreatic juice; pus from abscess of the stomach or liver; fæculent matter from the intestine. *During vomiting* much saliva may be swallowed; and bile, pancreatic juice, pus or fæces, not originally present in the stomach, may be pressed into it by the straining. Effusion of blood into its cavity may also be caused by the efforts of retching.

Method of Examination.—In examining the vomited matters it is advisable, first, to separate the larger pieces of undigested food by filtering the vomit through canvas or muslin.

The *solid residue* may be investigated by washing the larger pieces and tearing them up, or making sections of them, so that their nature may be ascertained. Partially digested curd is sometimes not very easy to recognise. When a large quantity of milk has been drunk at one time, the curd which it forms in the stomach may, when vomited, have the appearance of a piece of thick dense grey felt.

The *filtrate* should be put into a conical glass and allowed to settle. The reaction of the fluid

is to be ascertained by litmus paper. The presence of free hydrochloric acid may be tested for, by putting one drop into a watch-glass containing a one per cent. solution of tropeolin, the yellow colour of which is converted into a wine red if hydrochloric acid be present. The total acidity may be estimated by filtering and adding a standard solution of caustic soda or potash to a measured quantity of the filtrate, until it is neutralised. For the methods of examining more particularly the various acids — lactic, acetic, butyric, &c.—and other volatile substances, text books of chemistry must be consulted.

To ascertain the presence of pepsin in the vomit we add to it its own bulk of dilute hydrochloric acid (ten minims of dilute hydrochloric acid, B.P., to an ounce of water) and a flock of fibrin or a piece of hard-boiled white of egg; let it stand for several hours in a warm place; and then see whether or not the fibrin or albumen is dissolved.

To test for trypsin, we proceed in the same manner, but use the vomit without the addition of acid; and if it be already acid, neutralize it with bi-carbonate of soda.

To test the vomit for peptone, we must put some of it into a small dialyzer, and let it stand for some hours. We then add to the water in which the dialyzer has stood, solution of corrosive sublimate, which gives a precipitate with peptones; or some liquor potassæ and a drop of very dilute sulphate of copper solution, which gives a precipitate dissolving on shaking, and forming a red solution, changing to purple when more copper is added.

Bile is tested for in the filtered liquid by Gmelin's and Pettenkofer's tests.

For blood in the vomit *see* HÆMATEMESIS.

If the vomited matter be too thick to allow the sediment to subside, a little of it should be mixed with some distilled water and allowed to settle. A drop of the sediment is then to be examined microscopically; and the examination is facilitated by adding to one specimen a drop of iodine solution, and to another a drop of aniline red or blue solution. The substances most likely to occur are partially digested fibres of voluntary or involuntary muscle, elastic fibres, connective-tissue bundles from meat in the food, spiral fibres and green chlorophyll granules from vegetables, starch-granules — stained blue by iodine, torulæ or sarcinæ, blood-corpuscles, leucocytes, scaly epithelium from the mouth, cylindrical epithelium from the stomach, and casts of the gastric follicles—sometimes fibrinous, sometimes composed of cells and granules, which take up the aniline colour, and are thus rendered more easily visible.

Clinical and Pathological Indications.—If the vomited food be unchanged, or but little changed, it indicates either that the vomiting has occurred soon after a meal, or that the secretion of gastric juice is deficient either in quantity or quality. The food is usually comparatively little changed in nervous vomiting, or in cancer of the cardiac extremity of the stomach. In vomiting from cancer of the pylorus, or duodenal ulceration, the food is much more digested, as it remains much longer in the stomach. If

undigested food be vomited some hours after a meal, the vomit should be examined in order to ascertain whether pepsin or acid is deficient. Complete absence of hydrochloric acid has been observed in cases of amyloid degeneration of the stomach, and a deficiency of acid has been found experimentally in acute anæmic and febrile conditions. Abnormal acidity from fermentation of saccharine or farinaceous articles of food, and the consequent production of acetic, lactic, and butyric acids, occurs in chronic catarrhal conditions. In some cases of gastric catarrh starch appears to undergo a mucous fermentation, and large quantities of glairy material are formed. When fermentation has gone on to a great extent, the vomit may have a yeasty look, and should then be examined for sarcinæ and torulæ. *See* SARCINÆ; and STOMACH, Dilatation of.

Sometimes large quantities of a watery fluid are vomited. This is occasionally alkaline or neutral, contains potassium sulphocyanide, and digests starch. It consists of saliva, which has been secreted abundantly on account of reflex irritation arising from the stomach, and swallowed. At other times it is strongly acid, and appears to be secreted by the stomach. Sometimes the vomit appears to be a mixture of both of these fluids. Such vomiting may occur from nervous disturbance of the stomach, but may be symptomatic also of catarrh, ulcer, or cancer. Mucus in the vomit indicates catarrh of the gastric mucous membrane; and the more acute the inflammation, the more leucocytes occur in the mucus. Bile may be vomited pure, in the form of a tasteless golden-yellow substance like yolk of egg, from the action of poisons, but this rarely happens. Vomiting of bile, more or less green and diluted, or mixed with digestive secretions or food, occurs as a symptom in congestion of the liver; but it may take place in all kinds of vomiting, whatever its cause. Large quantities of bile, mixed with the secretions from the mouth and stomach, and forming a grass-green liquid (*vomitus æruginosus*), may be vomited in peritonitis and cerebral affections. The writer has also observed this character of vomit in opium-eaters. Constant absence of bile when vomiting is persistent, points to pyloric stenosis. Pus may get into vomit from the bursting of an abscess in the mouth or tonsils; it sometimes, though rarely, may arise from an abscess in the walls of the stomach; but it is more likely to come from abscess of the liver. Blood vomited in large quantity, and of a bright red colour, usually indicates ulceration of the stomach or cirrhosis of the liver. More or less altered, and in smaller quantity, it occurs in the diseases just mentioned, and also in cancer and yellow fever (*see* BLACK VOMIT; and YELLOW FEVER). It may also be present in hysterical persons who have swallowed blood, obtained from external sources, or by sucking hollow teeth. Cancer-cells in the vomited matters are diagnostic of the presence of that disease. T. LAUDER BRUNTON.

Urgent.

Kindly revise & return

to Dr. J. Mitchell Bruce,
70, Harley Street,
London, W.

before Jan 30th.

VOMITING (Lat. *vomo*).—Synon.: Fr. *Vomissement*; Ger. *Erbrechen*.

Definition.—Forcible expulsion of the contents of the stomach through the œsophagus.

Ætiology and Pathology.—Two things are necessary in vomiting, viz. squeezing of the stomach and relaxation of its cardiac orifice. Although the muscular fibres of the stomach itself may contract under the action of emetics, they seem to be unable to expel its contents unless aided by external pressure, for when the muscles of the abdomen are cut across vomiting does not occur. When the diaphragm and abdominal muscles are paralysed, vomiting is impossible, though the stomach may be in active movement. The stomach is not necessary to vomiting, which will occur when that organ is excised, and a simple bladder tied in its place; but when the stomach is present, mere pressure upon it by the diaphragm and abdominal muscles, as in coughing, does not expel its contents. In vomiting the contents of the stomach are squeezed out of it by the mechanical pressure of the diaphragm and abdominal parietes contracting simultaneously. When these muscles contract, if the cardiac orifice of the stomach remains closed, an ineffectual effort at vomiting, or retching, occurs; but if the cardiac orifice dilate, the gastric contents are expelled. The cardiac orifice is relaxed by means of the longitudinal fibres, which run along the under end of the œsophagus below the diaphragm, and then radiate completely over the stomach. When they contract they dilate the cardiac orifice, and at the same time aid the evacuation of the stomach by drawing the whole viscus towards the diaphragm. In the act of vomiting, then, the simultaneous contraction of three sets of muscles is required: (1) of the diaphragm, (2) of the abdominal wall, and (3) of the muscular fibres just mentioned in the stomach itself. The movements of these muscles are coördinated by a nervous centre, situated in the floor of the fourth ventricle in the medulla oblongata. This centre is closely associated with, though of course not identical with, the respiratory centre. The motor impulses from this centre are sent to the abdominal muscles, diaphragm, stomach, and œsophagus, by the intercostal, phrenic, and pneumogastric nerves respectively. The reasons for supposing that the nervous centre for vomiting is closely associated with the respiratory centre, are that the movements of vomiting are modified respiratory movements, that emetics excite the respiratory centre, and that their action is usually preceded by increased respiratory movement, while depression of the activity of the respiratory centre stops vomiting. When the blood is rendered very arterial by excessive respiration, a condition of apnœa, in which no need of respiration is felt, and no respiratory movements are made, is produced; but if emetics are then injected into the veins, respiration not only becomes more frequent, but apnœa can no longer be induced, unless the activity of the respiratory centre be lowered by narcotics.

The vomiting centre is usually excited to action by irritation of certain *afferent nerves*. These may either act directly upon it, or through the medium of the brain. The nerves of special sense act through the brain. The sight of a disgusting object, a disagreeable stench, or an unpleasant taste, may excite vomiting, and it may also be produced by the simple thought of such subjects. Blows on the head, or inflammation of the brain or its membranes, also excite vomiting. According to Budge, the cerebral centres for the movements of the stomach are in the right corpus striatum, and especially in the right optic thalamus. When these parts are irritated the stomach moves. Irritation of the corresponding parts on the left side of the brain does not affect the stomach.

Vomiting occurs in certain cerebral conditions, either affecting the brain itself or its membranes, such as cancer or tubercle of the brain, apoplexy, cerebellar hæmorrhage, softening of the cerebral substance, sometimes encephalitis, poisoning by narcotics, melancholia, profuse hæmorrhage, or tubercular meningitis. It is also one of the symptoms of Menière's disease of the semicircular canals. It also occurs in various diseases, in which, however, it is difficult to say whether the vomiting be due to direct affection of the brain itself, or to reflex action upon it from other organs. Such diseases are typhus, plague, yellow fever, cholera, and the cold stage of ague. Very painful impressions on sensory nerves throughout the body may excite vomiting. This is seen in cases of loose cartilages in the knee, in dislocation of a joint, or in a painful wound or operation. Here, also, it is uncertain whether the vomiting be produced through a direct connexion of sensory nerves with the vomiting centre, or whether the irritation acts indirectly through the cerebrum.

Certain afferent nerves appear to have a more direct connexion with the vomiting centre than others, and these require special consideration:—

(1) *Branches of the glosso-pharyngeal nerve to the soft palate, the root of the tongue, and the pharynx.*—These parts have a very close connexion with the vomiting centre, and tickling them with the finger or with a feather is one of the readiest means of inducing vomiting.

We find vomiting occurring in inflammation of the soft palate or tonsils, and also of the pharynx, especially in children.

(2) *The nerves of the stomach.*—The sensory nerves of the stomach are chiefly branches of the vagi, but they belong partly also to the sympathetic system. When the vagi are cut, vomiting becomes difficult, but efforts at retching occur, and the writer has seen vomiting take place from the action of emetics after section of the vagi. It is therefore evident that irritation of the stomach produces vomiting reflexly through other nerves than the vagi. Vomiting may occur from irritant substances in the stomach, whether introduced into the stomach, or formed within it; from irritation within the stomach, due to an inflamed or irritated condition of its walls; or from mechanical pressure, from without or from within. Thus it may occur from the presence of undigested food, from irritating substances produced by imperfect digestion, or from irritant poisons within the stomach. It may be due to catarrh or congestion of the mucous membrane itself, to softening of the mucous membrane, or to ulcer or cancer in the gastric wall. It may be produced by extreme distension of the stomach, by gas, liquids, or solids; by compression of a part of it within the body, as in hernia of the stomach; or by the pressure of a tumour upon it. It may be caused by violent compression externally with the hands; by the pressure of a too tightly laced corset; by the pressure against the abdominal walls of hard tools or benches in certain trades. It frequently occurs in cough, especially the cough of phthisis; but here it is probable that the vomiting is due partly to the violent compression between the diaphragm and abdominal walls, and partly to the congestion of the vessels which the continued interruption of the circulation during the fit of coughing brings on.

(3) *The nerves of the liver and gall-ducts.*—These consist chiefly of branches of the vagus and sympathetic. From irritation of them vomiting occurs in hepatitis, or during the passage of a biliary calculus. It is from irritation of these branches, also, that vomiting may occur in pleurisy of the right side, the congestion of the pleura on the upper surface of the diaphragm having led to congestive changes in the liver.

(4) *Intestinal nerves.*—Ligature of the intestine in animals produces vomiting,

which is arrested by dividing the nerves passing from the ligatured parts. In man it is the almost invariable accompaniment of strangulated hernia or intussusception, and it may even occur in obstruction of the bowel by fæcal matters in cases of obstinate constipation. It also takes place in peritonitis from irritation of these nerves.

(5) *The renal nerves.*—Vomiting occurs from irritation of these nerves, or by calculi in the pelvis of the kidney or passing down the ureter, and also in nephritis.

(6) *Vesical nerves.*—In cystitis vomiting occurs. It may possibly be due, however, not to irritation of the vesical nerves, but to extension of inflammation to neighbouring parts.

(7) *Uterine nerves.*—Irritation of these nerves is one of the commonest causes of reflex vomiting. It may be produced in animals on irritation of the uterine plexus, and occurs in the human subject during pregnancy or in metritis.

(8) *Ovarian nerves.*—Vomiting is a symptom of inflammation of the ovaries.

(9) *The nerves of the testicle.*—A blow on this organ tends very readily to produce nausea and vomiting.

The cause of vomiting in *sea-sickness* is uncertain, but it appears to the writer to be partly due to the condition of the nerve-centres, and partly to that of the viscera. *See* Sea-Sickness.

Treatment.—The treatment of vomiting is to be directed to two ends—(1) *to remove the cause* if possible; and (2) to *lessen the irritability of the vomiting centre.* The chief drugs which lessen the irritability of the vomiting centre are opium, morphine, bromide of potassium, chloral hydrate, and probably, also, hydrocyanic acid and belladonna. Strychnine and small doses of ipecacuanha are also useful in vomiting, and they probably owe their power to their action on the vomiting centre. Most of these drugs have a local sedative action on the stomach, and therefore it is advantageous to give them by the mouth when possible. Even when the stomach is very irritable, they may be retained by giving them in a concentrated form. When the stomach will not retain them, they must be given by the rectum or by subcutaneous injection. In sea-sickness the effect of the position of the head is sometimes very marked, and the vomiting may sometimes be arrested completely by removing all pillows and putting the head on a level with, or rather lower than, the body.

In cases of disease of the brain or its membranes, where it is difficult or impossible to remove the cause, we must try to lessen the congestion by means of leeches and cold applications to the head; and also to soothe the vomiting centre by hydrocyanic acid, or by bromide of potassium. At the same time, however, considerable benefit is obtained from the use of remedies which act locally on the stomach, these seeming to have some reflex effect upon the vomiting centre. One of the most useful is ice, which may be constantly sucked, and also swallowed in small lumps. Where the vomiting is dependent on the action of the poison circulating in the blood, as in the later stages of contracting kidney, we must endeavour to eliminate these by increasing the action of the kidneys and the skin. In vomiting dependent on inflammation of the mouth and fauces, we lessen the irritability by soothing or astringent gargles, confections, or glycerine. A confection or glycerine is often better than a gargle, inasmuch as it remains longer attached to the parts, and thus exercises a more prolonged effect upon them. When vomiting is due to irritant substances in the cavity of the stomach, such as indigestible food, and acrid fluids or poisons, it is best treated by evacuating them. A large draught of lukewarm water, alone or mixed with a teaspoonful of mustard, is one of the best means. Large draughts of warm water alone, even if they are not ejected, may give relief by diluting the acrid substances in the stomach so much

as to prevent their irritating the mucous membrane. In this way they sometimes relieve sick-headaches. It is of great importance sometimes, not only to prevent the formation of acrid substances by slow and imperfect digestion, but to prevent the mechanical irritation of the mucous membrane by undigested food. For example, we not infrequently notice that sickness and vomiting will occur in susceptible individuals after meals containing such substances as are not only slowly digested, but are swallowed in lumps. Examples of these are uncooked apples and cheese, or even potatoes, especially when imperfectly boiled or new. These articles, instead of being crushed to a powder by the teeth, are swallowed in lumps of considerable size, and apparently, instead of passing the pylorus, are retained in the stomach, and, partly by the mechanical irritation, and partly by their giving rise to acrid products, cause sickness. Milk, when swallowed in large draughts, or when there is too much acidity in the stomach, instead of falling in fine flakes will coagulate in large lumps, which have a similar effect to the cheese. To relieve this it is advisable to mix the milk with soda-water or lime-water, or to take it, as in the whey cure, by sipping.

When vomiting is due to slow or imperfect digestion, which allows decomposition or fermentation of food to take place in the stomach, it may be arrested by improving the digestion. Thus five grains of calomel, by acting on the stomach through the liver, may arrest vomiting; and tincture of walnut (the active principle of which, juglandin, is an hepatic stimulant) has also been recommended. Pepsine also, by facilitating digestion, may prevent vomiting; and bitters, such as calumba, may do so also, by preventing putrefaction or fermentation.

When decomposition or fermentation of food, with formation of acrid or irritating products, has once set in, it may continue a long time, as the organisms which cause it remain constantly in the stomach, and renew the process in every fresh supply of food. It may be stopped by antiseptics. Where the vomited matters are frothy and yeasty-looking, the sulphurous acid of the Pharmacopœia, in doses of one fluid drachm, diluted with half a wine-glassful of water, often arrests such vomiting like a charm. Creasote has a similar action, but possibly has some additional action on the nervous system, as it is useful even in cases where the vomiting does not appear to be due to decomposition of food. In dilatation of the stomach these antiseptics may fail, and the best results are obtained by washing out the stomach by a syphon.

For the treatment of irritant poisoning, *see* Poisoning.

When the mucous membrane of the stomach itself is inflamed or irritated, we must try to lessen the irritation. The best drugs for this purpose are ice, hydrocyanic acid, opium, and bismuth. The insoluble salts of bismuth, and especially the subnitrate, are to be preferred to the solutions; and it is advisable to combine them with magnesia, potash, soda, or carbonate of lime, according to the condition of the intestines, preferring the magnesia when the bowels are confined, and carbonate of lime when they are too loose. Sometimes the tendency to vomit is increased by lying on the right side. This is probably partly due to the drag of the stomach itself upon the cardiac extremity, and partly to the difficulty with which gaseous eructations escape from the stomach in this position. When there is a tendency to vomit, therefore, the patient should lie down on the left side after a meal. In the vomiting of hepatitis, in addition to opium and hydrocyanic acid, we may use ice-water, or ice swallowed, and leeches over the liver. In biliary calculus, we may give, along with opium, a full dose of ether internally, and in addition may employ ether or chloroform by inhalation; similar treatment may be adopted in cases of renal calculus.

In intussusception or hernia we must remove the cause, if possible. In peritonitis full doses of opium are best. For the vomiting in cystitis and ovarian diseases we must lessen the sensibility of the vomiting centres by the drugs already mentioned, and treat the local conditions.

In the vomiting of pregnancy we trust partly to the drugs already mentioned to act on the vomiting centre, and partly to local applications. It is sometimes arrested by the application of a 10 per cent. solution of nitrate of silver to the os uteri, or by slight detachment of the membranes around the margin of the internal os. Where all other methods fail, the induction of premature labour must be resorted to. *See* PREGNANCY, Diseases and Disorders of.

T. LAUDER BRUNTON.

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the exercises and games that every boy would get the maximum amount of benefit, and the smallest amount of harm. This proposal involves an action on the part of Universities, of which it is to be hoped they will recognize the advisability and take speedy steps in regard to it.

I perfectly recognize that physical exercise of one kind or another is absolutely necessary for boys in order to ensure their proper development. I also recognize that Watts' hymn, which I had to learn when I was a child "The devil finds some mischief still for idle hands to do" is perfectly true, and boys must be so occupied as to prevent them becoming loafers. Exercise within bounds tends to increase the power of the muscles, of the lungs, of the heart, and of the nervous system. The discipline of games is of the highest utility in training boys to obedience, self-sacrifice, bravery, alertness, and decision, and teaches them how to acquire command over

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